ROADS AND STREETS

1.

2.

3.

Only TIMKEN® offers all 3 rock bit types

Whichever type of removable rock bit is best for your job, you can get it from Timken®. Only Timken makes *all three* rock bit types.

1. **TIMKEN MULTI-USE ROCK BIT** gives lowest cost per foot of hole when full increments of steel can be drilled and when control and reconditioning are correct.

2. **TIMKEN CARBIDE INSERT BIT** offers many advantages under certain conditions—including extremely hard and abrasive ground, small holes, extra deep holes. Holes go down faster, bit reconditioning is simplified.

3. **TIMKEN ONE-USE "SPIRALOCK"** bit is recommended where reconditioning is not feasible. New "Spiralock" union holds bit on dependably, permits easy removal. Steel preparation is simplified, steels last longer.

. . . and a complete Rock Bit Engineering Service!

To help you select the *one* best bit for your job, Timken offers a *complete* Rock Bit Engineering Service. With *all three* types of rock bits to draw upon, the Rock Bit Engineering Service can help you get the bit performance your job needs—whether it's lowest bit cost, lowest cost per foot of hole, greatest possible drilling speed, or other desired advantages. *FREE ROCK BIT BOOKLET!* Write on your company letterhead. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".

your best bet for the best bit . . . for every job

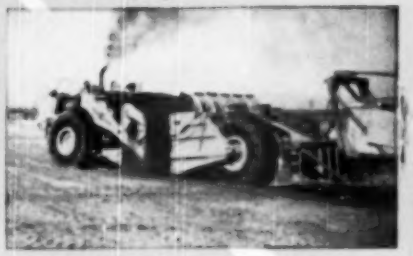
TIMKEN

TRADE MARK REG. U.S. PAT. OFF.

LaPLANT CHOATE

. . . the sure sign of more and more profitable earthmoving jobs!

HERE'S the sure sign of the extra yardage production that gets the job done faster and at lower cost on more and more jobs. Watch LPC Motor Scrapers in action . . . talk to the men who own them. Then ask your LPC distributor to explain *all* the big-production, high-profit features. LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa—LaPlant-Choate Sales and Service, 1022 77th Ave., Oakland, Calif.

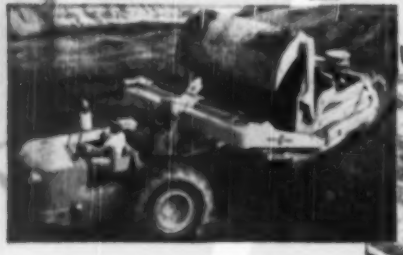


LaPLANT CHOATE One of the ways J. Robert Bazley uses Motor Scrapers for coal stripping at Mt. Carmel, Pa.

LaPLANT CHOATE Brown Construction Co. is piling up high yardage totals at Deming, New Mexico.

LaPLANT CHOATE Henry Doelger picks 4 Motor Scrapers to move 12 million yards of sand at Westlake, Calif.

LaPLANT CHOATE Two LPC Motor Scrapers are working for Bayer & Mingolla on the Route 2 by-pass, Leominster, Mass.



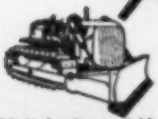
LaPLANT CHOATE Four LPC Motor Scrapers are speeding operations on the Sandrock Dam for List & Clark, Ft. Worth, Texas.

LaPLANT CHOATE For the Burlington Railroad relocation project at Chillicothe, Mo., Perry McGlone uses five Motor Scrapers.

LaPLANT CHOATE Patterson Construction Company has three units working on the Pennsylvania Turnpike at Steelton, Pa.

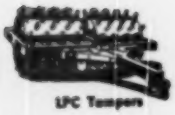
LaPLANT CHOATE

LPC TW-300 Motor Wagons



LPC Hydraulic or Cable Operated Dozers

LPC Rippers



LPC Tampers

Rigged with husky wire rope, power shovel takes huge bites of earth during rough grading.

Drill steel paves the way for blasting, to remove barrier of rock.

5 Miles of Relocation on U.S. 122

To cope with a steadily-mounting volume of traffic north of Reading, Pa., approximately five miles of U. S. Route 122 were recently relocated between Leesport and Hamburg. The new stretch of highway has two 24-ft lanes, separated by a 4-ft concrete divisor. Its construction included the erection of a bridge, a reinforced-concrete arch, and three culverts. Contractor for the project was C. W. Good, Inc., Lancaster, Pa. Bridge reinforcing, bar mats and dowel units were supplied by Bethlehem.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

Network of Bethlehem Reinforcing Bars, shown in place in one of three culverts. The entire project used more than 100,000 lb of reinforcing bars.

STEEL FOR HIGHWAYS

Dowel Units • Reinforcing Bars • Bar Mats • Guard Rail
Guard Rail Posts • Wire Rope and Strand • Pipe
Hollow Drill Steel • Spikes • Bolts and Nuts
Timber Bridge Hardware • Tie-Rods
Sheet- and H-Piling • Fabricated Structural Steel

BETHLEHEM STEEL

The 5-mile stretch of highway includes a reinforced-concrete arch, which is shown above. Rough grading for the new roadway completed in background.

With Bethlehem Reinforcing Bars bent to shape and securely tied, bucket of concrete is brought into position for initial pour. Crew stands ready.

ROADS AND STREETS

October, 1950 • Vol. 93 • No. 10

Roads and Streets represents 58 years of continuous publishing in the highway field; combined with Engineering & Contracting and Good Roads Magazines, established in 1892

E. S. GILLETTE, Publisher — CCA — HALBERT P. GILLETTE, Editor-in-Chief

In This Issue

Coming Articles

Repaving for Very Severe Conditions

The old concrete pavement was fragmented and a new concrete base and hot-mix asphalt topping placed on US 41 (Milwaukee to Chicago).

Hard Facing—the Contractor's Friend

Methods recommended for various familiar armoring applications will be reviewed, with diagrams and pix - guide to shop foremen and construction welders.

Developments in Airport Design

Summary of the important post-war effort to revise design curves for both flexible and rigid pavements, in light of pavement evaluation and test sections, and extend these curves for very heavy planes.

Scraper and Shovel Jobs

Contractors again made big yardages on earthmoving projects during 1950 season. Watch for a new series of reports on outstanding "blue ribbon" projects.

Also You'll Be Reading About:

Ohio's methods of maintaining traffic signals . . . Articles on snow and ice control . . . What the housing boom has done to city street departments . . . New quick test for field moisture . . . Revolutionary "highball" land clearing method . . . "Semi hot" mix asphalt resurfacing; and Indiana contractor's "bargain" cost-cutting set-up . . . How middle-western state maintenance departments cut down "high" shoulders (windrow loaders get workout).

Contractors and the superintendents . . . officials and engineers . . . something for all in each issue of "Roads and Streets". Watch for your next copy. Practical "how it was done" articles invited from readers.

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A magazine devoted to the design, construction, maintenance and operation of highways, streets, bridges, bridge foundations and grade separations, and to the construction and maintenance of airports.

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"I like the Positive Control of the Hydraulic HT4's Bucket"

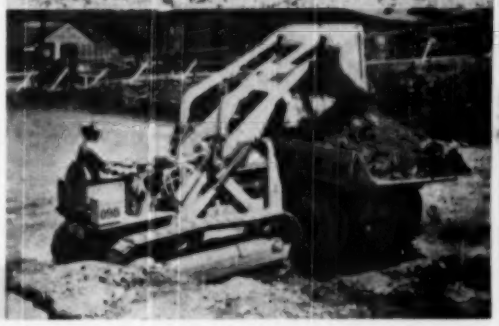
. . . OMAN CONSTRUCTION CO., NASHVILLE, TENNESSEE

. . . "It makes for quicker loading"

Three times per minute, this HT4 Hydraulic TRAXCAVATOR crowds its stoutly-reinforced 1¼ cubic yard bucket heaping full of scrambled rock and rubble.

. . . "and smoother dumping" . . .

Three times per minute, the HT4 swiftly lifts its heaped bucket; gives it the tilt that avoids spillage; pivots, and *eases* the heavy material into the truck to minimize body shock and abrasion.



Three "passes" load a truck, and the HT4 keeps three trucks busy; finds time to position the blasting mats and do some grading on this Nashville store basement excavating job.

"I've seen 'em all — nothing else can compare," states Job Supt., W. E. Mitchell, for Oman Construction Co., Nashville, Tennessee." I like the positive control on the Hydraulic HT4 TRAXCAVATOR'S bucket. It makes for quicker loading and smoother dumping."

The HT4 TRAXCAVATOR is operated by the "Caterpillar" constant-power hydraulic system with a 4-position valve. Lifting arm cylinders are double-acting — so are bucket control cylinders. Hydraulic "help" is there, to dig tough stuff. And the HT4 can lift its load to the desired height — can carry and dump from any lift point under positive control.

See your TRACKSON-"Caterpillar" dealer for full information on the HT4, or any of the other 4 TRAXCAVATOR Models (½ to 4 cubic yard capacity) that fits your needs and conditions. Or write direct to TRACKSON COMPANY, Dept. RS-100, Milwaukee 1, Wisconsin.

TRAXCAVATOR®

The Original Tractor Excavator

Don't buy Shovels "by the Yard"

DIPPER CAPACITY is JUST ONE MEASURE of VALUE

MARION *Invites you to* COMPARE

Important Features Before You Buy!

1. Are the crawlers long and wide . . . are the shoes forgings, manganese steel or just ordinary cast steel?
2. Are the clutches big enough? Will they overheat on the job you have in mind?
3. Is the machine equipped with independent crowd?
4. Do you know how much difference there is in line pulls and speeds on machines rated as having equal dipper capacities?
5. Are anti-friction bearings used at all important points of wear?
6. Compare rated crane capacities.
7. What kind of controls are used—compensating air, hydraulic or mechanical?
8. Is the operating machinery simple and easily accessible or is it complicated.
9. Are alloy steel shafts and heat treated machine cut gears used?
10. Are the hoist, crowd and swing speeds in proper balance for maximum production?
11. Compare weights and ballast.
12. Is the published engine horsepower rating the net or gross at the flywheel?

MARION *Invites*

these comparisons because they have an important bearing on how well a machine will perform, how long it will last and how much maintenance expense it will require over the years. COMPARE—see why MARION is the first choice of BUYERS WHO COMPARE!

MARION

POWER SHOVEL COMPANY

MARION, OHIO, U.S.A.

B.F.Goodrich

Hauling giant loads over blasted rock this B. F. Goodrich tire outlasts them all

IN ROAD contracting service in Tennessee, North Carolina and Virginia, the equipment pictured above is engaged in the tire-killing business of working its 32,000 pounds over the sharp rock of blasted terrain. Add a total load weight of 16 cubic yards of rock and earth, and it's easy to understand why bruises and blowouts make off-the-road tires a major cost item in such equipment.

Such was the story, at least, until B. G. Young & Sons of Johnson City, Tenn., owners of the fleet, turned to B. F. Goodrich *double nylon shock shield* tires to combat the high cost of tire mortality in such rugged service. Since then, costly road delays and work interruptions have been cut to a fraction of what they had formerly considered normal. The BFG Universal tires shown above, for example, have been in service for well over a year—*and not one has yet been removed from its wheel.* Mr. B. G. Young says, "The service we obtain from B. F. Goodrich tires with nylon shock shield is far and beyond anything we have ever experienced before."

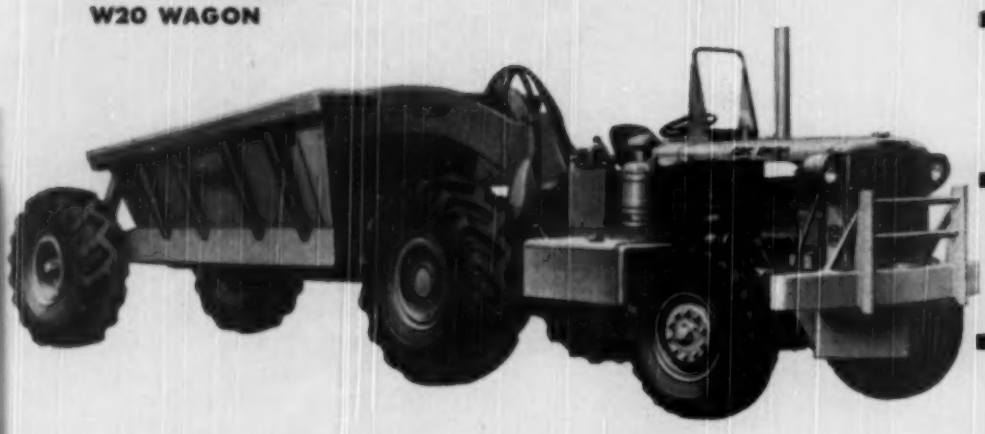
Only B. F. Goodrich off-the-road tires have the *double nylon shock shield.* (It's patented.) Layers of nylon cord, built between the tread and body plies, shield the cord body by smoothly distributing shocks and strains. This plus factor of extra mileage and service hours in BFG tires is yours at no extra cost. Then, too, because there's a specially-designed deep tread for every need, you can look forward to good traction far beyond the time when ordinary tires must be changed over to service on free-rolling wheels.

So see your B. F. Goodrich dealer. Specify BFG tires for your new equipment. Enjoy longer tire service and lower overhead offered you by *The B. F. Goodrich Company, Akron, Ohio.*

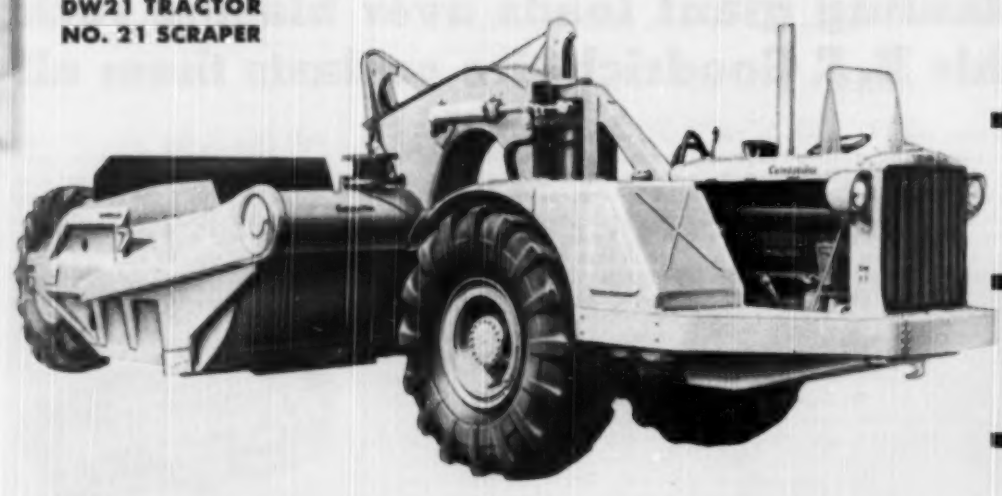
RESEARCH KEEPS
B.F.Goodrich
FIRST IN RUBBER

2 GREAT NEW ADDITIONS

DW20 TRACTOR
W20 WAGON



DW21 TRACTOR
NO. 21 SCRAPER



TO THE "CATERPILLAR" LINE

—TO BRING YOU STILL GREATER EARTHMOVING CAPACITY AND SPEED

Accompanying the Tractor features generalized (below, right) the Wagon member of this big-capacity unit offers:

17 cu. yds. capacity, struck; 25 cu. yds., heaped.

Travel speeds, through tractor's 5 gear ratios, ranging from 2.88 to 26.6 m.p.h.

Generous size hopper to provide good target for shovel or dragline loading.

Controlled dumping . . . openings can be varied without mechanical adjustment—permitting either dumping or windrowing.

Accurate hydraulically controlled dumping with positive mechanical lock on dump doors.

THE DW20 TRACTOR AND NO. 20 SCRAPER UNIT

The "Cat" No. 20 Scraper is available also for the DW20 Tractor. It has the same capacity and general specifications (except in type of gooseneck) as the No. 21 Scraper described below.

THE ENGINE: ***Both prime movers have the new 6-cylinder "Cat" Diesel Engine . . . 275 HP. peak capacity at 2,000 r.p.m. tested in accordance with A.S.M.E. Power Test Codes; 225 HP. at 1,900 r.p.m. available at the flywheel.***

Accompanying the Tractor features generalized (right), the 2-wheel DW21 offers:

Full 90° turn each way.

Travel speeds, through 5 gear ratios, ranging from 2.16 to 20 m.p.h.

Scraper capacity is 15 cu. yds., struck; 19½ cu. yds., heaped. (With available 12" extensions, 18 cu. yds., struck; 22½ cu. yds., heaped.)

Bowl and apron are designed to promote "boiling" action of earth through center of load—for full-measure yardage and minimum loading time.

Large low-pressure tires for easy load flotation.

'Dozer-type ejection for positive "kicking out" of sticky material; dependable spring-action ejector return.

Open bowl design to permit visible loading under shovel or dragline.

Adjustable rear axle to permit level cuts and desired settings.

Double bottom of special alloy steel. Self-sharpening reversible cutting edge.

High apron lift, low center of gravity.

FOR high-speed hauling . . . for high production . . . "Caterpillar" offers two new earthmoving units — the 4-wheel DW20 and the 2-wheel DW21.

With a completely new 6-cylinder Diesel Engine producing 225 HP. available at the flywheel, the newcomers give users their choice of high-speed wheel-type prime movers.

The DW20, with top speed of 26.6 m.p.h., has 2 design matched trailed units . . . the "Cat" W20 Wagon (25 cu. yds. heaped capacity) and the "Cat" No. 20 Scraper (19½ cu. yds. heaped capacity).

The DW21, with top speed of 20 m.p.h., trails the "Cat" No. 21 Scraper (19½ cu. yds. heaped capacity).

And, as always, "Caterpillar" quality, dependability, durability and work capacity are built in . . . backed by the unparalleled parts and service facilities of the world-wide "Caterpillar" dealer organization.

For further information on these two new units, contact your dealer or write the factory.

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

TRANSMISSION

Constant-mesh transmission, and heavy-duty clutch. Special locking device that prevents gears from becoming disengaged.

BRAKES

Each large, heavy-duty brake is 22" in diameter, 7" wide. Compressed air energized brakes on both tractor and drawn member of unit. Handy control valves for applying both sets of brakes, and to right or left driving wheel.

STEERING

Hydraulic booster steering that follows the natural "feel of the road" hand guidance. Heavy steel stops for keeping gooseneck of drawn equipment from jackknifing.

OPERATOR COMFORT

Airfoam rubber cushion on bucket-type seat mounted on coil spring with hydraulic snubber. All controls within easy reach. Excellent visibility.

CATERPILLAR

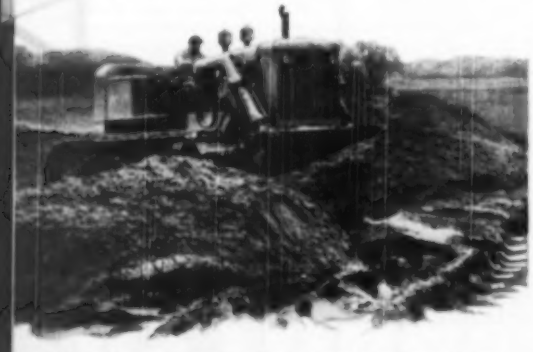
DIESEL ENGINES • TRACTORS
MOTOR GRADERS • EARTHMOVING EQUIPMENT

again!

SUCCESSFUL BIDDERS* CHOOSE HD-19's for Major Projects...

Now The New Jersey Turnpike

EVEN FLOW OF POWER means smooth, fast loading. Torque converter automatically synchronizes speeds of the HD-19's pulling and pushing — work as one! Starts and stops are made through throttle — no constant clutching, no sudden shocks to operator and equipment on pusher contacts.



SPEEDS BULLDOZING. Bigger loads are rolled faster . . . load, terrain and use of throttle govern forward speed — and there's no stalling of engine! High reverse gets HD-19 back for each pass quicker. No job is too tough to handle with its ground-gripping traction and heavy, correctly balanced weight.

Big Fleets of New Torque Every Grading Contractor

Some of the reasons big, rugged HD-19's are preferred—

HYDRAULIC TORQUE CONVERTER DRIVE eliminates most gear-shifting . . . keeps tractor working at higher average speeds . . . provides smooth, cushioned performance. Increases production, cuts maintenance costs.

EASIER, FASTER SERVICING through simple unit assembly. Major units can be removed and repaired or replaced without removing unrelated parts. Simpler construction throughout.

FOR GREATER PRODUCTION
FOR EASIER OPERATION
FOR SIMPLIFIED SERVICING

Converter Tractors . . . Some Over 20 Units . . . are used by on this Outstanding 118-Mile, 40,000,000 cu. yd. Job

SIMPLIFIED MAINTENANCE AND LUBRICATION. All adjustments unusually accessible. All fittings or lubrication points readily reached — none under tractor. Extended lubrication periods—1,000 hours on truck wheels, track idlers and support rollers.

FULL OPERATOR COMFORT. With gear-shifting practically eliminated and hydraulic fingertip steering, operator's job is much easier — fatigue is cut, output goes up. Many other operating advantages.

RUGGED, DEPENDABLE. 40,000 lb. of properly balanced weight . . . long, wide, sure-gripping tracks — a powerful, heavy tractor that really "bears down" . . . outperforms and outlasts under any operating conditions.

• • •

On any job . . . big or small . . . tough or easy . . . you will cut costs, increase profits with powerful HD-19 Hydraulic Torque Converter Tractors. "Seeing is Believing." Ask your Allis-Chalmers dealer for a demonstration.

ALLIS-CHALMERS

TRACTOR DIVISION • MILWAUKEE 1, U. S. A.

Originator of the Torque Converter Tractor

"C" TOURNAPULL licks

Helps *A. F. Schams* complete 120,000-yd. sand-fill overpass ahead of schedule

120,000 yards of wet sand . . . a borrow pit which had no natural drainage and was still water-logged after two weeks of pumping . . . 4 to 8% adverse grades and soft, sandy haul roads. These were the conditions which Contractor A. F. Schams of La-Crosse, Wisconsin, tackled on overpass fill construction for U.S. Highway 12 & 16 south of Mauston. Production was slow throughout the first month. Then Schams brought in a fast-stepping electric-control C Tournapull . . . put it to work moving the heavy material from under water . . . and immediately boosted daily output with performance like this:

Delivers 9.5 loads per hour

Using a pusher to load, the rubber-tired Tournapull picked up 12 pay yards of sand in 65 seconds . . . highballed up soft, loose bank out of pit . . . hauled 1660′ up 4 to 8% grades to fill . . . and spread in 18 seconds. Average round trip time: 6½ minutes. Average hourly production on the 3200′ cycle: 114 pay yards. "I am very well satisfied," says owner Schams. "Performance has been very good." Here's why C Tournapull helped Schams finish his job way ahead of schedule:

Power-proportioning Tournamatic differential—plus extra traction and flotation afforded by big 21.00 x 25 low-pressure tires—kept the 16-ton-capacity C Tournapull lugging through the wet borrow pit, and up grades in soft, shifting sand. Positive power steer, fingertip electric controls, and high hauling speeds all helped move more yards per day . . . at lowest-net-cost-per-yard.

Like Schams, you'll find it pays to modernize your fleet with new rubber-tired, electric-control C Tournapulls. Their performance will amaze you, whatever your job—in wet or dry materials . . . over long hauls or short. Ask your LeTourneau Distributor for all the facts. Write or call him TODAY.

Contractor Schams watches as his Tournapull quickly spreads heaped load of clean wet sand. Rig's low-pressure tires provided excellent compaction on fill.

LeTOURNEAU

Send NOW *to:* R. G. LeTOURNEAU, Inc., Peoria, Illinois, for complete information on new, 30 m.p.h. C Roadster-type Tournapull for use with:

NAME ..... TITLE .....

COMPANY .....

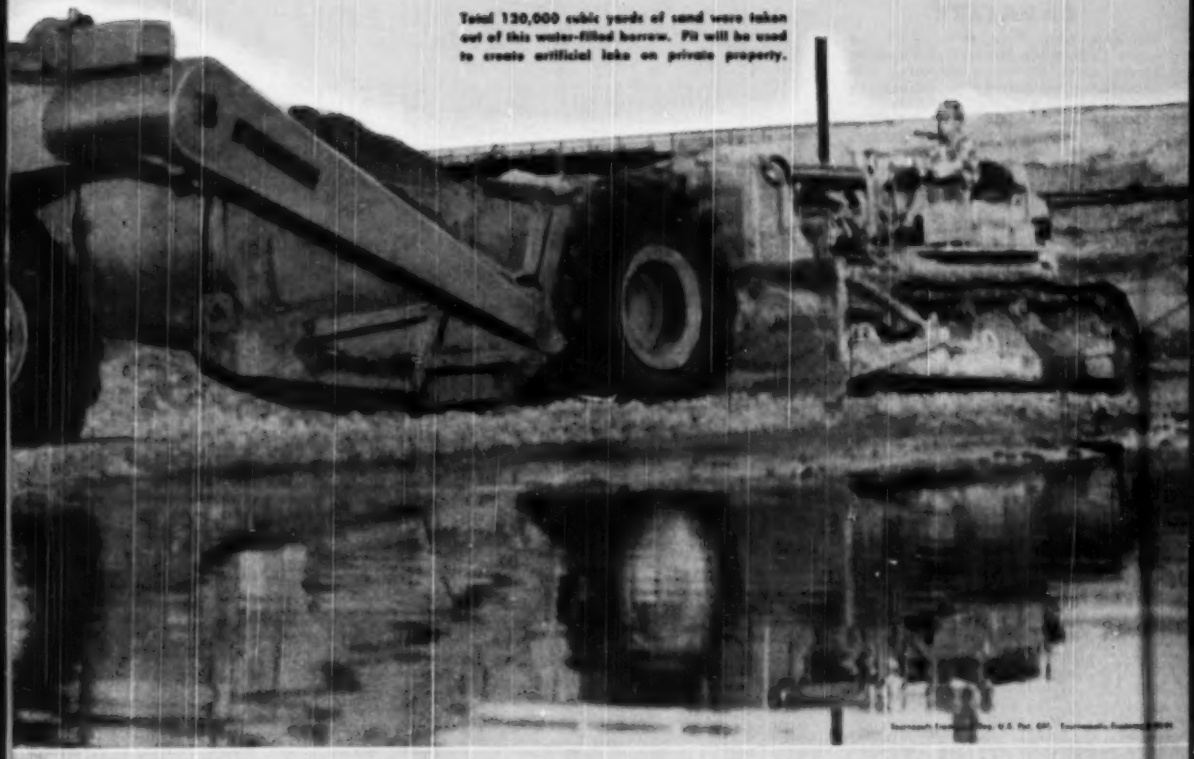
STREET .....

CITY ..... STATE .....

Type work to be handled .....

- ☐ 13.5 cu. yd. Carryall Scraper
- ☐ 17 cu. yd. rear-dump Tournarocker
- ☐ 15 cu. yd. bottom-dump Tournahopper

wet sandy BORROW PIT



Total 120,000 cubic yards of sand were taken out of this water-filled borrow. Pit will be used to create artificial lake on private property.

LETOURNEAU PEORIA, ILLINOIS — PROVED — ***TOURNAPULLS***

MORE YARDS PER HOUR WITH RUBBER-TIRED POWER

Brand New

Cedarapids

Built by IOWA

LARGER SCREENING CAPACITY

The large Double Deck (40" x 14'0") low angle Cedarapids Horizontal Vibrating Screen gives the extra screening area needed for big volume production on material with heavy fines content or contaminated with excessive amounts of soil, sand, clay and semi-wet material. Cedarapids Horizontal Screens are famous for their high capacity production at the lowest possible cost.

LARGER CONVEYORS

30" width conveyors are used in the Super Tandem. Heavy channel of the 14" conveyors that are standard on the Junior Tandem to take care of the increased capacity resulting from the larger screening area.

UNDERSCREEN SAND REJECTOR CONVEYOR

By means of the ejector conveyor construction and the 48" x 7'-6" Sand Ejector Conveyor that is built into the screen base frame, it is possible to remove all sand from the material or blend desired amount of sand with the crushed aggregate to meet the mixture specifications.

CONTROL PANEL IS EXTRA—WHEN REQUIRED

A controller is furnished with each vibrator, containing an operating switch, an electronic valve and a dial rheostat which varies the power of the vibration, permitting the controller to be set at the point which gives the best results. The electronic valve changes alternating current to pulsating waves with a time interval between each wave to give the vibrators a long stroke.

SYNTRON VIBRATORS IF EXTRA—IF REQUIRED

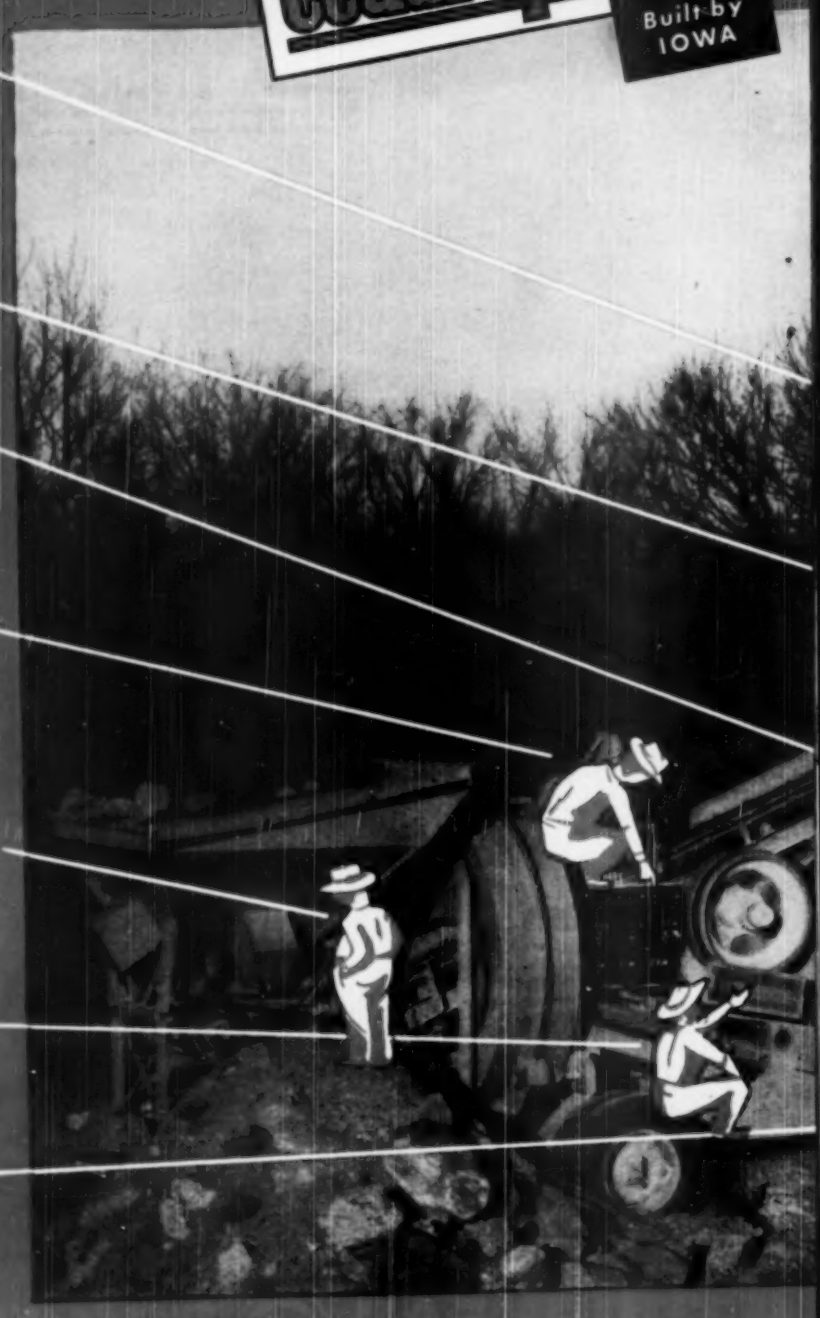
As extra equipment, six Syntron Vibrators are available for use on the hopper and under the screen bin to make stubborn materials flow freely, eliminate arching and plugging of wet material and to eliminate air pockets and voids, making it possible to produce aggregate to pits previously considered unworkable.

JAW CRUSHER

The Super Tandem uses either the 1024 or 1030 Jaw Crusher, the same as the Junior Tandem. All Cedarapids Jaw Crushers are engineered to give exceptionally high crushing capacity and the most economical operating cost per ton of finished product.

ROLL CRUSHER

For secondary crushing, the Super Tandem uses the same 2414 Cedarapids Roll Crusher used on the Junior Tandem. Manganese steel roll shells, large, heavy flywheels and other quality construction features assure maximum long life and ability operation.



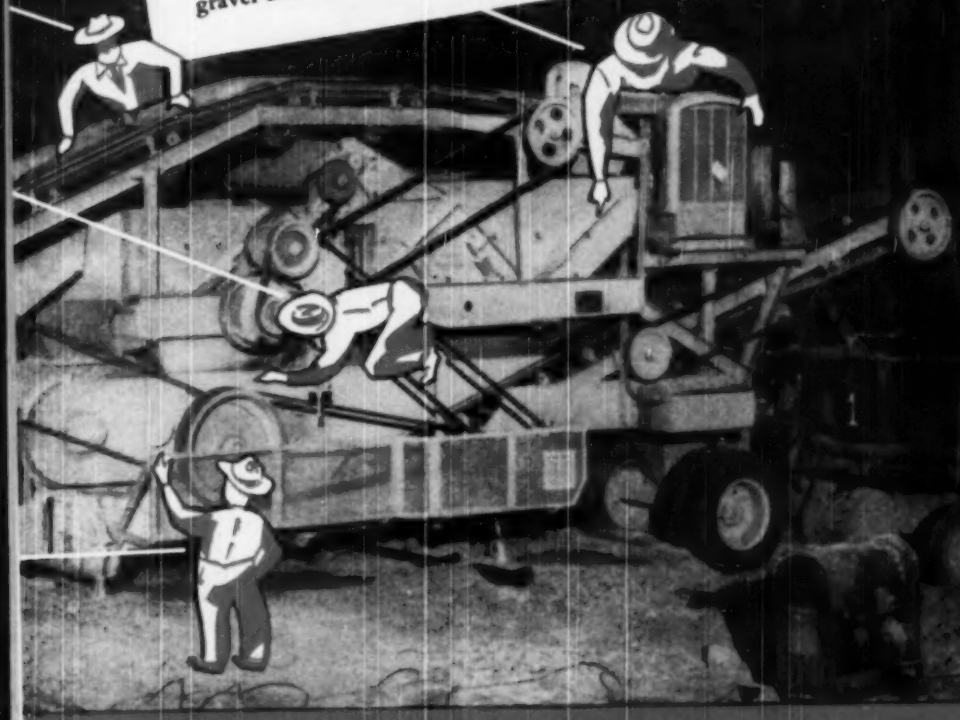
THE IOWA LINE of Material Handling Equipment Includes:

ROCK AND GRAVEL CRUSHERS • BELT CONVEYORS • STEEL BINS • BUCKET ELEVATORS • VIBRATOR AND REVOLVING SCREENS • UNITIZED ROCK AND GRAVEL PLANTS • FEEDERS • TRAILERS • PORTABLE POWER CONVEYORS • PORTABLE STONE AND GRAVEL PLANTS • REDUCTION CRUSHERS • BATCH TYPE AND VOLUMETRIC TYPE ASPHALT PLANTS • SAND WHEELS • DRAG SCRAPER TANKS • WASHING PLANTS • SOIL COMPACTION UNITS • STEEL TRUCKS AND TRAILERS • KUBIT IMPACT BREAKERS • DOUBLE ROTOR IMPACT BREAKERS

SUPER TANDEM

for BIG VOLUME, LOW COST aggregate production

HERE'S the newest star in the Cedarapids line of quality engineered crushing and screening plants. The Super Tandem retains all the high crushing capacity of the Junior Tandem Plant, with an additional 45% increase in screening area to fill the need for a plant that can process material containing high percentages of fines or contaminated material. The Super Tandem produces two sizes of finished product, with capacities conservatively rated from 70 to 120 tons per hour of average material under normal operating conditions. Capacities are based on average gravel crushing to 1" and minus with 33 1/3 oversize to be crushed.



IOWA MANUFACTURING COMPANY

Cedar Rapids, Iowa, U. S. A.

PROVEN PROFIT ON BIG JOBS

A million yards of excavation or just a hundred . . .

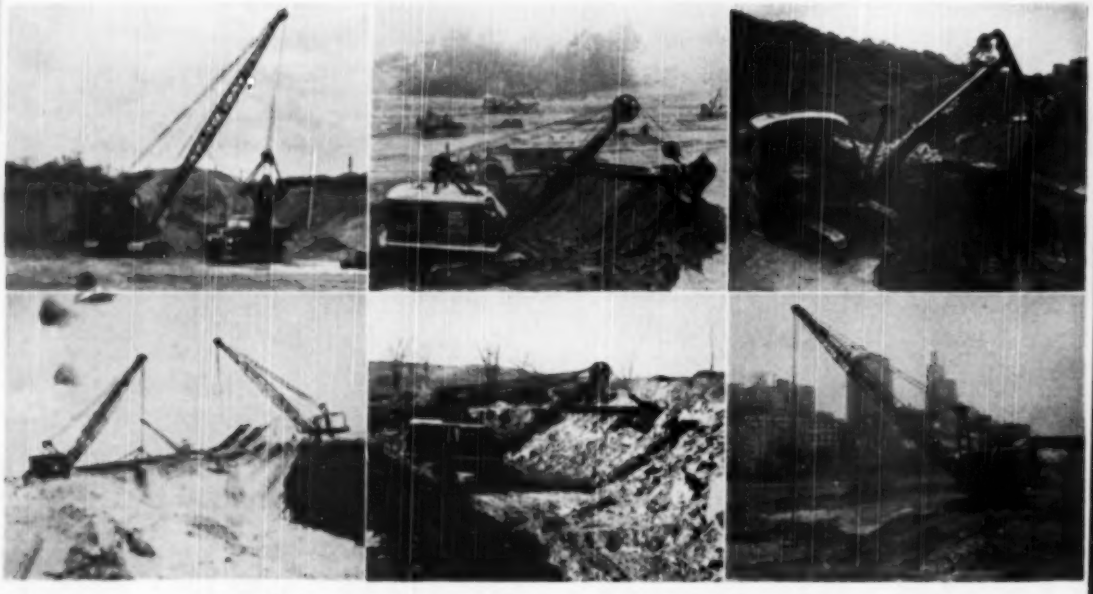
Thousands of tons of steel to erect or only a few . . .

A mile of trench to dig or only a block . . .

Concrete to place for a huge dam or for a small culvert . . .

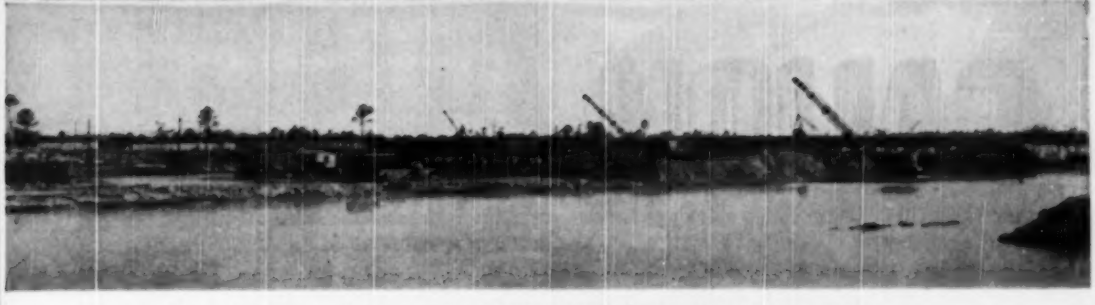
BIG or small, your jobs bring in bigger profits if you rely on Bucyrus-Erie excavators and cranes. Their proven speed, dependability, and durability show up in bigger output per day, per month, per year. That's why, all over the world, you find Bucyrus-Eries on so many jobs . . . BIG and small.

SOUTH MILWAUKEE **BUCYRUS ERIE** WISCONSIN

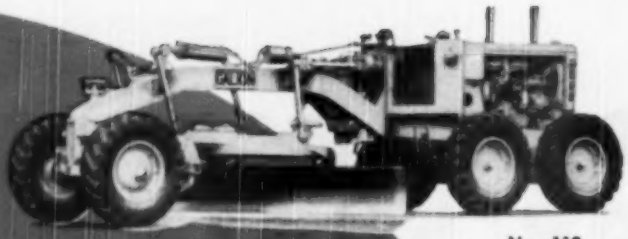


PRODUCERS OR SMALL

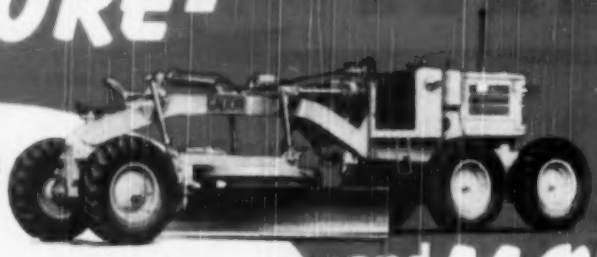
See your Bucyrus-Erie distributor for full information on Bucyrus-Erie gasoline, diesel, or single-motor electric ⅜ to 4 yard excavators.



MORE and MORE-

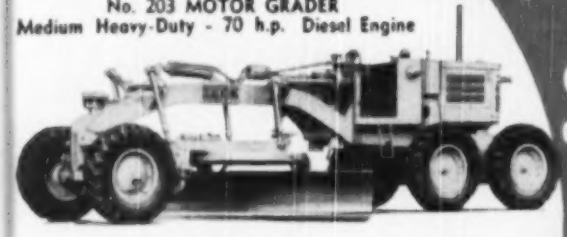


No. 118
MOTOR GRADER
Extra Heavy-Duty
100 h.p.
Diesel Engine



No. 104
MOTOR GRADER
Heavy-Duty
- 76 h.p.
Diesel Engine

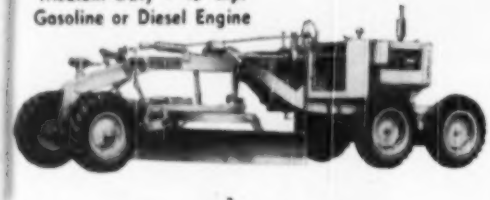
No. 203 MOTOR GRADER
Medium Heavy-Duty - 70 h.p. Diesel Engine



and MORE-

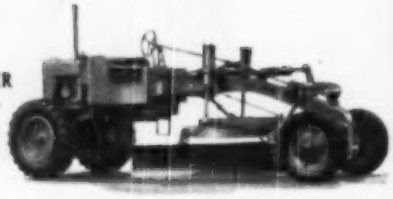
CONTRACTORS, HIGHWAY and STREET DEPTS. ARE USING GALION GRADERS

No. 303 MOTOR GRADER
Medium-Duty - 45 h.p.
Gasoline or Diesel Engine



Superior Value and Performance Count --- with experienced construction men. That's why their preference for GALION Graders is becoming more pronounced every day. A size for every need and use. Write for information on the size in which you are interested.

No. 402
MOTOR GRADER
Light-Duty -
31 h.p.
Gasoline
Engine



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CF&I
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WELDED WIRE
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REINFORCEMENT
Specifications:
WIRE: Shall conform to the Standard Specifications for cold-drawn Steel Wire for Concrete Reinforcement (A.S.T.M. Designation A-82) of the American Society for Testing Materials.
FABRICATION: Assembled by automatic machine which assures accurate spacing and alignment of all members; all wires securely connected at intersections by a process of electrical-resistance welding; the entire operation in accordance with Standard Specifications for Welded Steel Wire Fabric for Concrete Reinforcement (A.S.T.M. Designation A-185-37).
GAUGE RANGE: Transverse Wires No. 14 Gauge to No. 0 Gauge.
Longitudinal Wires No. 14 Gauge to No. 000 Gauge.
SPACING RANGE: Transverse Wires 2" minimum increasing to 16" maximum by 1" increments (excluding 11", 13", and 15" spacings).
Longitudinal Wires 2" minimum increasing by 1/2" increments.
LENGTHS: Rolls—To and including 300'.
Mats—Length as required (suitable for loading on cars).
WIDTHS: To and including 150".
PACKAGED: In Mats or in Rolls.
The Colorado Fuel and Iron Corporation
GENERAL OFFICES: DENVER, COLORADO
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The TACOMA NARROWS BRIDGE

Uses CLINTON Reinforcing Fabric

• Like many other modern reinforced concrete projects, this one uses welded wire fabric. There is a Clinton fabric designed to meet your requirements . . . Specify Clinton, now and always.

The California Wire Cloth Corporation
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CLINTON WELDED WIRE FABRIC

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Give More Pay-Load Miles at Lower Cost per Mile

Trucks equipped with Eaton 2-Speed Axles make fewer stops for gas and oil. That's because these Eaton Axles double the number of available gear ratios in any truck, thus permitting the use of the most efficient ratio for every driving condition. As a result, the engine operates at economical speeds—doesn't strain and struggle on hills or when starting under full load . . . runs effortlessly on the straight-away. This means, too, that stress and wear on engine and major power transmission parts is minimized. These operating and maintenance economies—plus the higher trade-in value of Eaton equipped trucks—enable Eaton 2-Speed Axles to more than pay for themselves on trucks of the 1½ ton class and larger. Ask your truck dealer to show you what this means to you.

Axle Division
EATON MANUFACTURING COMPANY
CLEVELAND, OHIO

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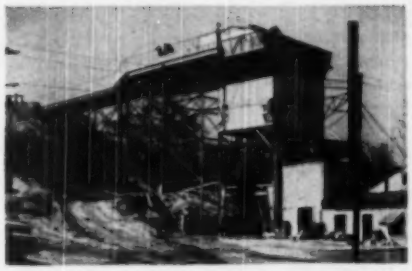
"It's a Great Line of Mixers!"



FOR CENTRAL MIXING This modern plant of the Clark Certified Concrete Company, Inc., of Baltimore, Md., produced 125,000 yds. of pre-mixed concrete during the past year. Vice-President Duncan writes: **"Your Blue Brute 84-S Stationary Mixer has proven entirely satisfactory. Maintenance costs have been practically nothing."**

FOR PORTABLE MIXING. La Roy W. Vivol, chief engineer of the O'Sullivan Rubber Corporation, Winchester, Va., reports: **"We are extremely gratified by our Blue Brute 3½S Tilting Mixer, which has had two years of constant, severe use. It is extremely mobile, well constructed and performs excellently. Long exposure has not decreased its efficiency. The mixing cycle is fast and the mix consistently uniform. It is a pleasure to endorse and recommend this equipment."**

FOR TRANSIT MIXING. President Bob McCarkle of the Abilene, Texas, Concrete Company, gives his reasons for re-ordering Blue Brute Hi-Up Truck Mixers: **"We have compared competitive makes on our jobs and find your Hi-Ups best in every way. Maintenance costs have been negligible. Just purchased your first chain-drive Hi-Up and find it even better than the older machines — faster charging and discharging, easier to maintain and smoother running."**

FOR PLACING. In building the Washburn vehicular tunnel under the Houston, Texas, ship channel, the "Trench method" of construction was used. The last yard or two of concrete placed in each of the section joints had to be placed *straight upwards* — a tricky pouring problem. Merritt-Chapman & Scott Corporation reports **an easy solution was found with the aid of a Blue Brute Pneumatic Placer, which performed excellently.**

Yes, among Blue Brute owners it's a never-ending story of more concrete at lower cost, trouble-free operation, time and money saved in every detail of mixing operations. Why not look into this proof that *there's more worth in Worthington*? See your nearby Worthington-Blue Brute Distributor, or write for bulletins on mixer types in which you're interested.

NATIONAL READY MIXED CONCRETE ASSOCIATION

Worthington Pump and Machinery Corporation
Construction Equipment Department
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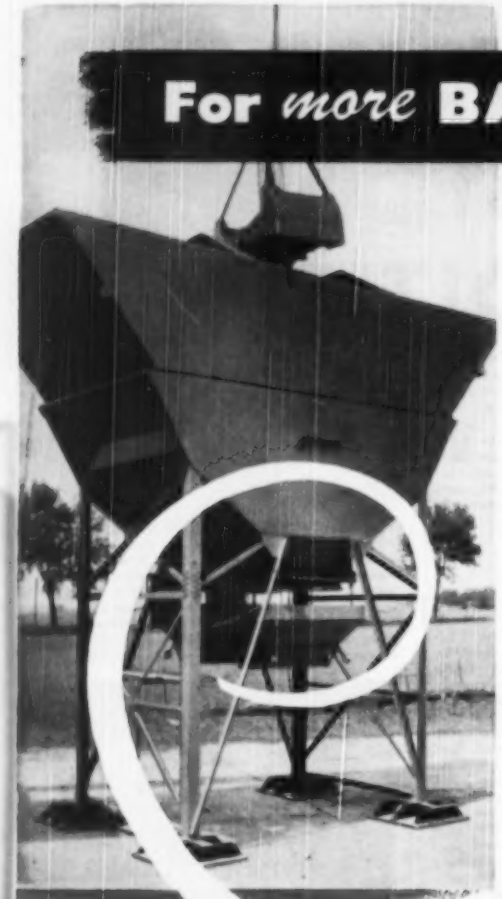
WORTHINGTON

BUY BLUE BRUTES

60.4

IF IT'S A CONSTRUCTION JOB, IT'S A BLUE BRUTE JOB

For *more* BATCHING SPEED....



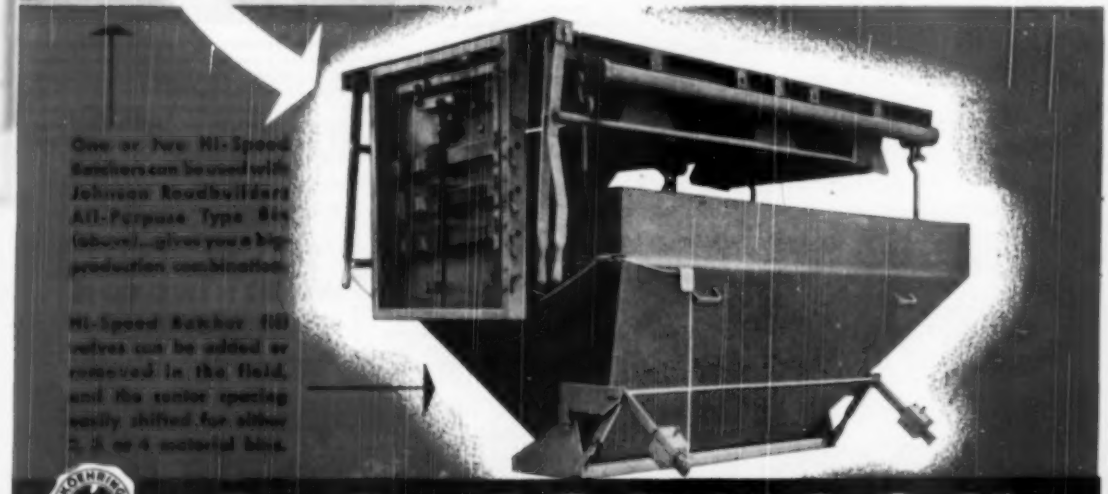
JOHNSON *Hi-Speed* Batcher handles 2, 3 or 4 materials

Where you want high-speed batching and extreme accuracy for uniform strength concrete every batch, plus quick convertibility to handle 2, 3 or 4 materials, check the Johnson Roadbuilders' Hi-Speed Batcher. Its extra-wide fill valves permit high-speed filling, and retain minimum batcher height.

Standard Hi-Speed Batcher has wide-discharge hopper and scale beams to handle standard batch for 34-E pavers. Self-loading, counter-weighted discharge gate on weigh hopper is easily tripped . . . opens wide . . . extra-steep angle of bottom cleans out hopper fast.

For charging truck mixers, Hi-Speed Batcher can also be equipped with 2, 3 or 4-yd. weigh hoppers. Truck-mixer type has 4-compartment bin . . . 1 for sand, 2 for aggregates, and 1 enclosed compartment for cement. Both truck-mixer hopper and wide-discharge hopper are interchangeable on the scale frame. Overhead unit frame supports all fill valves, hand levers, aggregate hopper and weigh beam box . . . provides convenient reassembly, and insures accurate alignment of scale parts at all times.

Let your Johnson Distributor show you *all* the Hi-Speed Batcher features that will help you produce top-quality concrete fast, with most economical use of materials.



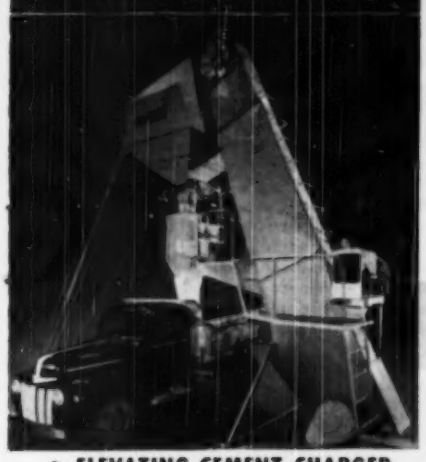
One or two Hi-Speed Batchers can be used with Johnson Roadbuilders All-Purpose Type Bin (above)—gives you a high-production combination.

Hi-Speed Batcher fill valves can be added or removed in the field, and the center spacing easily shifted for either 2, 3 or 4 material bins.

KOEHRING PRODUCT

C. S. JOHNSON

ACCURACY



ELEVATING CEMENT CHARGER

for batch plant or transfer plant operation. Standard Charger has size 14, 1000 lb. cap. cement weigh batcher hung under a 33-bbl. overhead storage hopper. Upper hopper can be equipped with two 1000 lb. weigh batchers. Quickly adapted to transfer plant by adding 50-bbl. extension hopper.

ROADBUILDERS DUTCH MILL

has 50, 100, 150-bbl. storage capacities. You can start with one 50-bbl. section, and add extra sections, as needed, to 150-bbl. maximum. Easy to erect, dismantle; elevator casing unit and drive are attached to each bin section. House section is big enough for dual batchers.

COMPANY
KOEHRING SUBSIDIARY
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Save 25% with 205 shovel-pull shovel

Koehring ½-yard 205 has dual-purpose boom for both shovel and pull shovel operation . . . costs 20 to 25% less than conventional units requiring two separate booms. Crowd and retract cable is self-contained in boom . . . stays intact when boom is removed . . . saves time when you convert to crane, clamshell, dragline. Get all the facts in new 205 bulletin.

KOEHRING COMPANY

Every batch a perfect mix

Improved mixing action of the revolving drum of the Kwik-Mix 16-S Dandie mixes every batch of concrete for perfect texture. You get better concrete because every particle of the aggregate is completely cement-coated. Same thorough mix in all Kwik-Mix Dandie mixers including 3½-S, 6-S, and 11-S sizes. Tower Loader available.

KWIK-MIX COMPANY
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Sidesteps side obstructions

Boom of the Parsons 221 Trenchliner* quickly and easily rides on rollers from side to side across the full width of the Trenchliner. That's why the Parsons 221 Trenchliner can cut a trench as close as 10" from side obstructions. Trenches up to 8'6" depth, 16" to 36" wide.

C/969 rev.

*Reg. Trade-mark

PARSONS COMPANY
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GULF PRODUCTS *and* FINE SERVICE

keep equipment rolling on Pennsylvania Turnpike Eastern Extension

Frank Mashuda Company, Milwaukee, Wisconsin is the general contractor on Section 21-A of the Eastern Extension in Cumberland County, Pa., which includes the job of connecting the new highway with the existing Turnpike at Middlesex. The photo below shows the nearly completed link with the clover-leaf under construction. The road to the left in the photo is part of the new Extension, and that to the right is part of the existing Turnpike.

FRANK MASHUDA Company is one of a number of leading contractors on the Pennsylvania Turnpike Extension who find that the use of Gulf products is reflected in better operating records for equipment.

Always of the same uniform high quality, Gulf lubricants and fuels work as a team to help contractors do a speedier, more profitable job. Gulf lubricants provide an extra margin of protection to equipment under all types of operating conditions—and Gulf fuels insure maximum engine power and efficiency.

Write, wire, or phone your nearest Gulf office today and arrange to use Gulf Quality Lubricants and Fuels on your next job. They are quickly available to you through more than 1200 warehouses in 30 states from Maine to New Mexico.

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"Surveyed" your hauling costs lately?

DODGE trucks are "Job-Rated" to cut costs!

"Job-Rated" ...for low cost transportation

It's a pleasure to "survey" truck operating and maintenance costs—when they're *low*.

And the best way to keep costs low is to standardize on Dodge "*Job-Rated*" trucks—because they're "*Job-Rated*" for low-cost hauling.

Dodge trucks are powered with engines that are "*Job-Rated*" to give you top-notch performance, with economy. You'll enjoy lower gas and oil costs . . . fewer repair bills, too.

Remember . . . "It's a long haul between overhauls" with Dodge "*Job-Rated*" trucks!

Take a look at the list of other Dodge truck advantages at right. Then . . . for a good deal . . . see your Dodge dealer today!

POWER: . . . 8 great truck engines—each "*Job-Rated*" for *PLUS* power.

ECONOMY: . . . priced with the lowest. "*Job-Rated*" for dependability and long life.

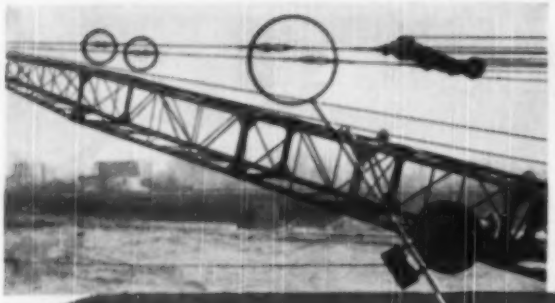
BIGGER PAYLOADS: . . . carry more without overloading axles or springs because of "*Job-Rated*" *WEIGHT DISTRIBUTION*.

EASIER HANDLING: . . . sharper turning! Parks in tight places. "*Job-Rated*" maneuverability!

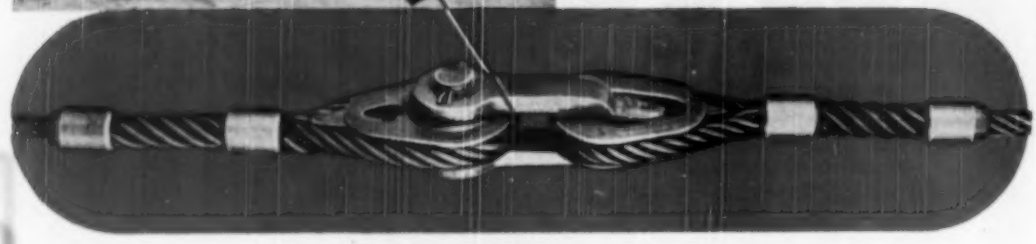
COMFORT: . . . widest seats . . . windshield with best vision of any popular truck. Air-cushioned, adjustable "chair-height" seats.

SAFETY: . . . finest truck brakes in the industry . . . hand brake operating independently on propeller shaft on *all* models—½-ton and up.

With all their extra value DODGE "Job-Rated" TRUCKS are priced with the lowest



DUALOC
BOOM CABLES



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4 IMPORTANT ADVANTAGES—

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2 **COMPLETE, ACCURATE INSPECTABILITY.** No wrappings, tapings or solderings. Completely open for inspection at any time. You can always know the exact condition of your Boom Cables.

3 **COMPLETE ADAPTABILITY.** Endings have same dimensions as zinced sockets—can be installed without alteration to present equipment.

4 **NO LOWERING OF WIRE ROPE STRENGTH.** Strength in all parts equal to full catalog strength of the wire rope. You have all the advantages of these assemblies with full assurance of all the strength built into your equipment by the manufacturer.

DUALOC Boom Cables are ACCO-Registered. This is assurance of highest quality workmanship combined with top quality material—Preformed Green Strand Improved Plow Steel Wire Rope.

Write for this folder which gives more detailed information

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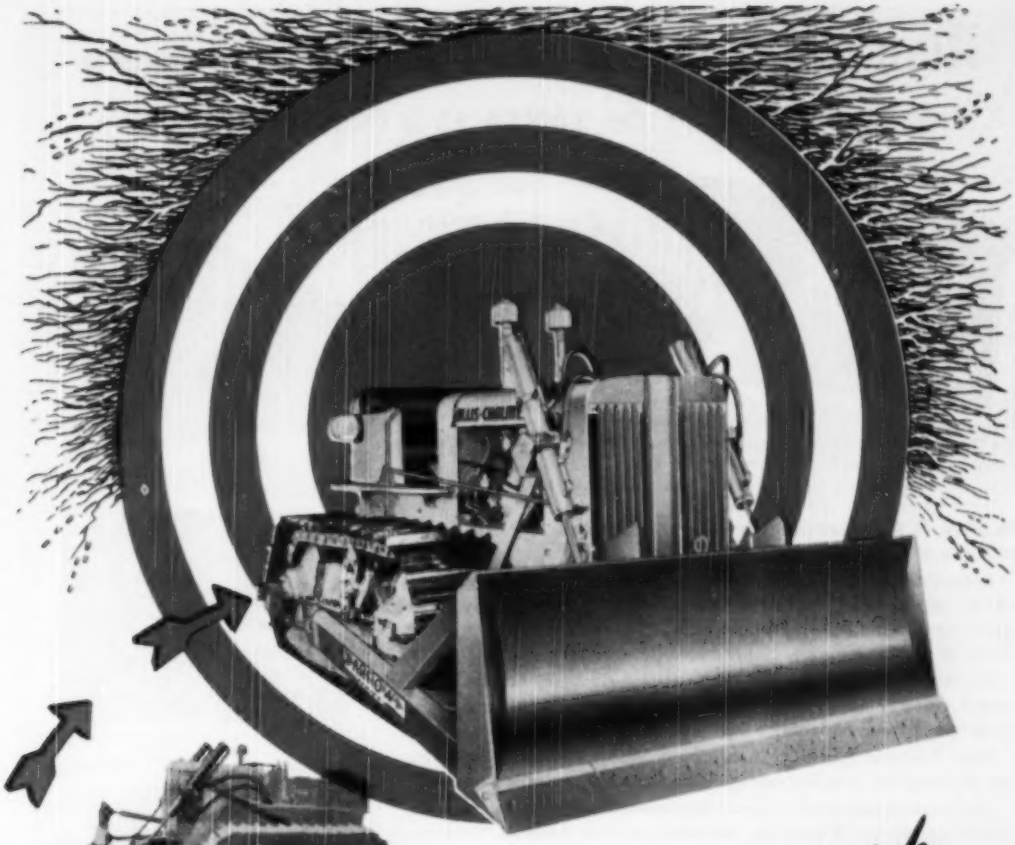
WIRE ROPE SLING DEPARTMENT

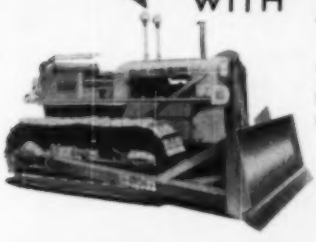
DUALOC BOOM CABLE ASSEMBLIES

In Business for Your Safety



Hit the mark every time!

WITH **ARROW DOZERS**



For strength . . . stamina . . . ease of operation . . . long, useful life . . . appearance . . . you can depend on ARROW DOZERS to hit the mark every time. That is why they are winning new users every week in all parts of the world. ARROW DOZERS are naturally better because they are designed and built by men who have spent years operating construction equipment on all types of jobs. And ARROW DOZERS ARE MADE FOR PRACTICALLY EVERY MAKE AND MODEL TRACTOR. Mail the coupon below TODAY for the name of your nearest ARROW dealer.

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Please send us the name of your nearest dealer and complete information on a Cable ☐ Hydraulic ☐ Bull ☐ Angle ☐ Dozer for a (an) ..... Tractor.

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FIRM .....

STREET .....

CITY & STATE .....

Here today – *and still here tomorrow*

THAT'S THE STORY OF SANTA FE'S CONCRETE STREETS

Don Gaspar Ave., paved in 1912.
Photos taken in 1925 and 1949.

Santa Fe, N. M., paved its first street with concrete in 1912. Today the majority of the city's paved streets are concrete.

Santa Fe motorists and taxpayers have reason to be proud of these streets, examples of which are shown on this page, for they have given long, faithful, ***low-annual-cost*** service and are still carrying traffic of ever-increasing weights and volume.

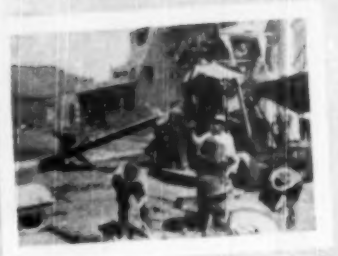
In recent years, the load has been particularly heavy because shipments to the Atomic Energy Commission town of Los Alamos move from the railhead at Santa Fe over the city's streets.

Dave Thornburg, City Engineer, states: "Since the streets were paved the maintenance cost has averaged less than $65 per mile per year."

The outstanding durability and ***low annual cost*** of these Santa Fe streets are typical of concrete pavements all over America. Concrete pavements are also safer—day or night, wet or dry—because concrete's gritty surface is uniformly skid-resistant and its light color provides greatest visibility at night.

Concrete pavements usually cost less to build than other pavements of equal load carrying capacity. They require much less maintenance and give longer service. Thus they render real ***low-annual-cost*** service—the true measure of pavement cost.

For more information write today for a free copy of *"Concrete Pavement Design."* Distributed only in the United States and Canada.



Shelby St., paved in 1921.
Photos taken in 1921 and 1949.

PORTLAND CEMENT ASSOCIATION

Dept. 10-28, 33 W. Grand Ave., Chicago 10, Illinois

A national organization to improve and extend the uses of portland cement and concrete... through scientific research and engineering field work

South Federal Place, paved in 1934. Photos taken in 1934 and 1949.

4 questions every dump truck user should ask about new International 6-wheelers

QUESTION: "I hear new Internationals are heavy-duty engineered. What does that mean to me?"

ANSWER: "Heavy-duty engineered" means that extra stamina and durability are built into every one of the thousands of parts that go into new International 6-wheel Trucks. This gives you the long life and savings in operation and maintenance that have kept Internationals first in heavy-duty truck sales for 18 years.

QUESTION: "What other assurance do I have that new International 6-wheelers will do a good job on *my* particular job?"

ANSWER: From new valve-in-head engine to new bogie assembly, every new International 6-wheel Truck is *specialized* for years and years of outstanding 6-wheel truck performance. In addition, every model has been *proved* right from every standpoint in actual 6-wheeler operation.

QUESTION: "What do new Internationals offer in the way of new advancements?"

ANSWER: You get the new Comfo-Vision Cab—"roomiest cab on the road." You get the new third differential that eliminates the need for an extra propeller shaft and a power divider, thereby reducing truck weight. You get new Super-steering and new Super-maneuverability for easier handling and turns in the shortest practical circle. You get a new valve-in-head engine, new frame, new improvements from bumper to tail light.

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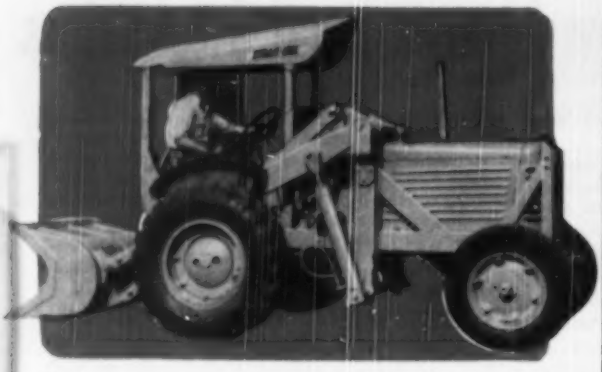

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Add them all up . . . ability to select your type of digging, front or back as the job requires . . . Strait-Line operation with back digging which gives you faster operation, greater traction and easy steering . . . fuller buckets . . . and you'll see where your operations can profit with the Strait-Line. For information and literature, see your Oliver Industrial Distributor or write direct to The OLIVER Corporation, 19300 Euclid Avenue, Cleveland 17, Ohio.

Conventional front digging, primarily used with Strait-Line where unit digs and moves straight ahead to load.

Back digging. Note how extended loading lips easily penetrate the bank.

PUSH-TILT action which lifts cutting edge 20" and thrusts it into bank.

Carrying position—bucket is tilted to retain load and is carried low enough to increase both traction and stability.

Dumping position. Bucket has been carried over the roof and dumps in front.

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Cost analyses of hundreds of thousands of square yards of both reinforced concrete and flexible type pavements prove that concrete is lowest in annual cost.

SPREADS THE LOAD

The subgrade underneath any pavement ultimately has to sustain the loads put upon the pavement. Reinforced concrete, being a rigid material after it hardens, spreads the load over a wide area of subgrade.

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Records from 27 state highway departments – all of which segregate surface maintenance costs from other items of expense – covering an average period of 13¾ years show that surface maintenance on all other types costs from 49 per cent to 400 per cent more than for reinforced concrete.

LOW FIRST COST

To bring a flexible type pavement up to the load-carrying capacity of a rigid type reinforced concrete pavement would require such a depth of material as to make the cost excessive.

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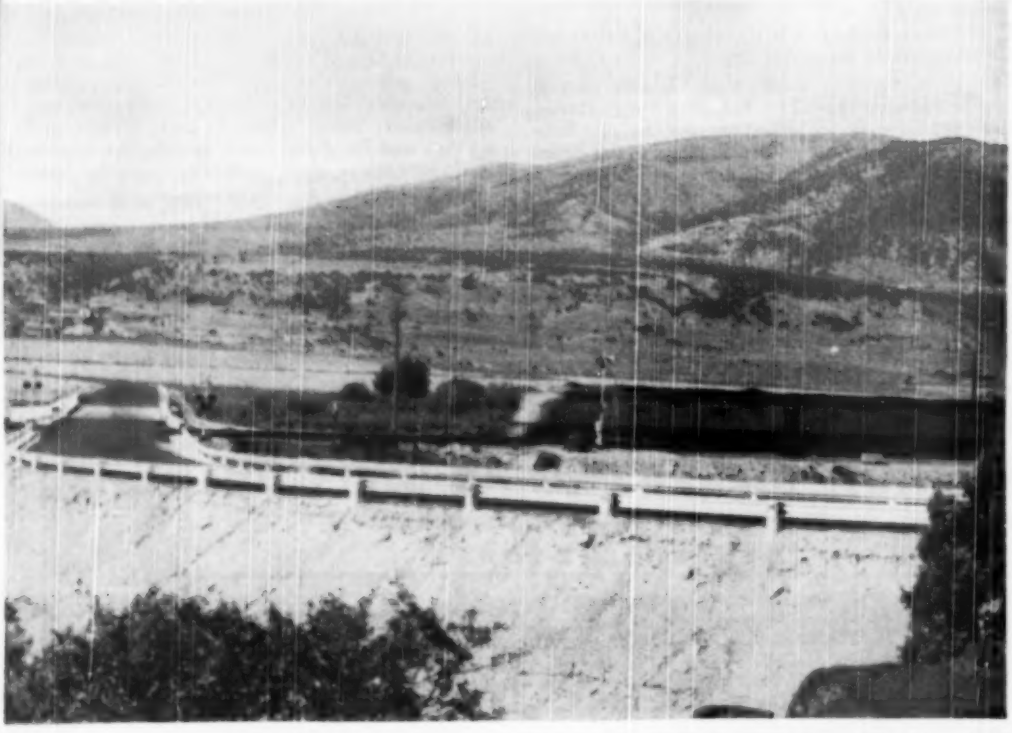

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ROADS AND STREETS

October, 1950 • Vol. 93 • No. 10

Tidal Flats and Man-Made Problems are Major Difficulties on the

NEW JERSEY TURNPIKE

By Col. V. J. Brown
Associate Editor of "Roads and Streets"

Unprecedented in cost, engineering complexity and in ultimate economic importance, the New Jersey Turnpike is being built under a 2-year construction schedule that is also without precedent considering the difficulties and volume of work involved. Presented herein is the most complete summary and progress report on this project yet to be published

PROBLEMS in connection with the prosecution of the New Jersey Turnpike, as distinguished from problems connected with the location, design, and construction of the original Pennsylvania Turnpike, may be called man-made rather than natural. However, there is one noteworthy natural problem on the new New Jersey Turnpike, and that is the one of crossing the miles of tidal flats, referred to in New Jersey as "meadows."

When we think of engineering a highway project, we generally conceive of the problems entailed in adapting a proposed line to land contours and control points, such as railroad crossings, bridge crossings, rock cuts or tunnels, flood water heights, reduction of curvature and directness of route. The most important problems encountered are usually those of overcoming obstacles; i.e., adapting an economical location to the natural terrain. That was the principal problem of the original Pennsylvania Turnpike.

While these exist in the New Jersey Turnpike project, the more important problems, those causing the most trouble and the overcoming of most of the high construction costs may be called "man-made" problems. This is brought forcibly to our attention when we look over the location and terrain from a few miles north of the Raritan River crossing to the northern terminus of the project.

In general, this article will cover three topics regarding the New Jersey Turnpike:

A.—Background Information
B.—Stabilization of Tidal Flats, and
C.—"Man-Made" Problems.

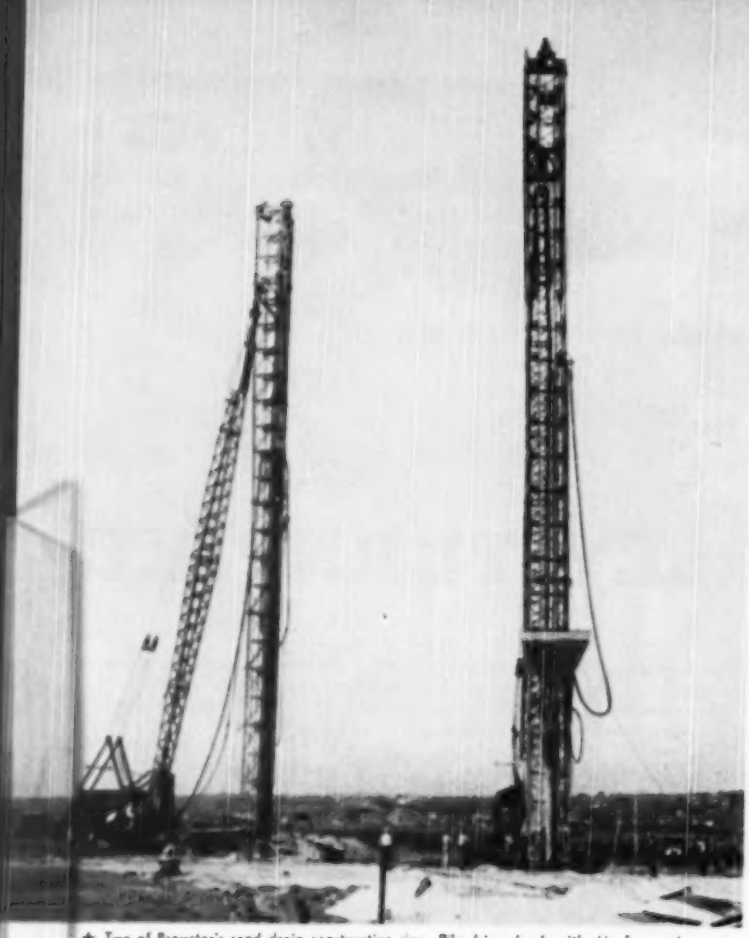
Many pictures, diagrams, and tables are included with little or no discussion regarding them on the principle that tables, drawings, and pictures can be correlated by the reader and as complete a picture could be obtained as could be given in a lengthy story.

Background Information

The New Jersey State Highway Department has long recognized the need for a fast relief route in the approximate location of the Turnpike, sans grade crossings and stop lights, and had actually done some construction work on part of it. However, as the New Jersey Turnpike's engineers have pointed out, "Authorities agree that the building of this artery under the present state highway program and with usual state highway funds would be only a theory and impossible of practical accomplishment. The building of the Turnpike as a toll project, with only the user paying for its construction and maintenance, will permit the normal state highway program to be much more effective in caring for the normal highway needs of the State."

The line map shown herewith gives a general location of the 117.3-mile route. As will be noted, the Turnpike at the south end connects, by means of an interchange, with State Routes and also directly with the Delaware Memorial Bridge (a new suspension span now under construction) just north of the Pennsville Ferry at Deepwater. At the north end, by means of an interchange, it connects with New Jersey State Route 6 just south of the George Washington Bridge over the Hudson River. In between these are 14 other interchanges. The project is divided, in general, into two divisions, the north (from Bonhamtown to N. J. No. 6) and the south (from Deepwater or the Delaware Memorial Bridge to Bonhamtown). These two main divisions are further subdivided into sections, as shown by an accompanying table.

Centralization of policy making and approval of designs, with decentralized surveying and designing work and construction supervision, was selected as the most rapid and most economical method of accomplishing the objective—a scheduled Turnpike opening in November, 1951. The accompanying organization diagram shows the functional administrative,



★ Two of Brewster's sand drain construction rigs. Pile driver leads with skip for sand are attached to the crane boom of diesel powered cranes. The core, the steel tube with self opening base when pulled, is driven like an ordinary pile to firm bed below. At end of driving, the core is filled with sand (as shown by skip dumping) then withdrawn leaving a sand-filled hole. Compressed air drives automatic hammer instead of steam.

surveying, design, and construction control. Engineers have estimated the total construction cost to be $149,-030,000. However, the items of Real Estate, Repayment to N. J. State Highway Department, Engineering, Administration and Legal, Contingencies, and Interest during construction bring the estimated total to $220,-000,000, for which bonds will be issued as funds are required. Financing is a separate story in itself, particularly the standby service feature which makes any or all of the money available, as desired. Private capital will be employed exclusively, without the pledge of the faith or credit of the State being required.

There is no highway of equivalent length within the entire United States which can compare with this Turnpike in its direct connection with huge concentrations of people, buildings, industries, wealth, commercial activity, and highway traffic movements. It is these conditions that have brought about the man-made obstacles and problems previously mentioned.

It is inevitable that in a very few years, barring national emergencies, the New Jersey Turnpike will connect directly with the Pennsylvania Turnpike, and other turnpikes, bridges, and freeways, thus offering tremendous relief to the traffic congestion now existing along our Eastern seaboard, and rapid contact with the Midwest.

An interesting accompanying bar chart gives a graphic picture of the probabilities.

Turnpike engineers state that the New Jersey Turnpike will be the highest type of highway design and construction which modern techniques, equipment, advanced theory, tests, and fullest experience can produce. Accompanying cross-sections are included to show the type of design employed. Alternate bituminous and concrete designs have been prepared for the surfaces.

Cross-Section Design

The critical load to be used in the pavement design, as recommended by the consulting engineers, is a single axle load of 36,000 lb. This recommendation was reached after full consideration of loadometer surveys made by the State Highway Department and the effects of recent state legislation limiting axle loads to 22,-400 lb. after a grace period of five years. The recommendations were made as noted because the Turnpike will be subjected to a large number of axle loads exceeding 22,400 lb. and ranging up to 45,000 lb., prior to the expiration of the grace period allowed by the State law.

In order to prevent base failures, and therefore surface failures, the pavement foundation is being constructed of selected granular material in the two courses of base and subbase, and is being compacted to 95% of modified AASHO compaction requirements, to a depth of at least 4 ft. below top of pavement. This high compaction is being maintained in both cut and fill sections in addition to maintaining density and moisture control throughout all embankments.

Special sub-base aggregate, Grade B, 12 in. in depth, is a frost resistant material with a plasticity index of not more than 6, placed directly on the soil substructure under the grading

Some Turnpike Quantities

On 87.2 Mile South Section

250,000 cu. yd. earth removal and backfill
7,500,000 cu. yd. excavation
5,750,000 cu. yd. borrow
4,150,000 cu. yd. selected base fill
1,725,000 sq. yd. shoulders
$2,700,000 drainage cost
$2,825,000 for topsoiling, fertilizing, seeding, etc.

On 30.1 Mile North Section

883,000 cu. yd. unclassified excavation
225,000 cu. yd. rock excavation
161,000 cu. yd. muck excavation
10,500,000 cu. yd. borrow excavation
2,044,000 cu. yd. of overload removal
2,197,000 cu. yd. of sand blanket
3,288,000 lin. ft. vertical sand drains.

★ Artist's drawing of the Passaic River bridge, awarded to Bethlehem Steel Company; looking south, where Turnpike passes under west approach to Pulaski Skyway. River span will be 375 ft., the longest plate-girder design in the U.S. Full length of structure, almost 7,000 ft. Underclearance, 110 ft. from mean high water.

contracts, and is so graded that not more than 10% passes a 200 mesh sieve. It has a CBR of not less than 15% when compacted to 100% of maximum density.

Special base aggregate, Grade A, 6 in. in depth, is a pervious, free draining, frost resistant material, classified as A3 by the Bureau of Public Roads (Hogentogler) classification. The P. I. does not exceed 3 and the material is graded so that not more than 6% passes a 200-mesh sieve. A CBR of not less than 20% is required when compacted to 100% of maximum density.

Grade A material is placed directly upon Grade B material, both supporting the pavement over the soil subgrade.

Regarding consolidation of the soil substructure up to the subgrade, it is interesting to note that six passes of regular heavy construction equipment are considered equivalent to the use of rollers having a load of not less than 25,000 lb. on each tire. The subgrade is finished with lighter rubber-tired rollers or standard 3-wheel rollers to within a tolerance of one-half (½) inch.

These operations are concluded in the grading contracts.

Pavement types described below are those recommended, since, at this writing, there has been no official publication of the cross-sectional designs.

Asphaltic Concrete Pavement

In general, the asphaltic pavement recommended is the following:*

A light-colored reflecting and skid-resistant seal coat on 4½ in. of asphaltic concrete placed in two layers on 8 in. of macadam which in turn is placed on a 6 in. aggregate course. This 18½ in. of pavement thickness will be placed on the base and subbase courses (Grade A and Grade B, respectively) described in the preceding paragraphs.

Particular gradations are required for the various courses. Space prevents describing the courses in this article. It is interesting to note that the three-axle bump rollers are specified as alternate to the 10-ton three-wheel rollers. Asphaltic concrete must be spread by approved type spreaders. Three-axle bump rollers *must* be

★ Location of the New Jersey Turnpike is such that it will serve the Philadelphia-New York axis, skirt numerous cities en route, and also carry the heavy Eastern Coastal traffic up from Wilmington, Baltimore and Washington and points south.

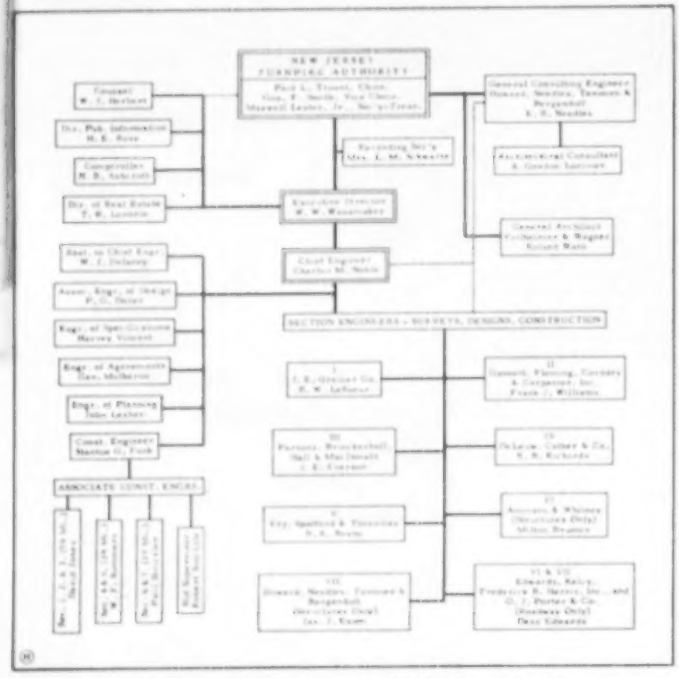
*For a discussion of pavement designs proposed, see article in September 1950 Roads and Streets, "7-Foot-Thick Flexible Pavement Planned for the N. J. Turnpike," by W. R. Macatee. This article also touches on the concrete design alternate.

New Jersey Turnpike—Geographical Locations of Sections

Section	Location		Counties
I	From:	State Highway Route No. 44 near Deepwater, New Jersey	Salem
	To:	State Highway Route No. 45 Southeast of Woodbury	Gloucester
II	To:	State Highwty Route No. 38 Northeast of Moorestown, Burlington County	Gloucester Camden Burlington
III	To.	A few feet from the Hamilton-Washington Township Lines (between Robbinsville and Allentown)	Burlington Mercer
IV	To:	South bank of the Raritan River Northeast of New Brunswick	Mercer Middlesex
V	To:	Morse's Creek near the Borough of Linden	Middlesex Union
VI	To:	Southerly side of Belleville Turnpike Midway between Passaic and Hackensack Rivers	Union Essex Hudson
VII	To:	N. J. Route No. 6 (U. S. Route 46) in Ridgefield Park	Hudson Bergen

based on the asphaltic concrete finishing to insure smoothness. Side forms must also be used. A surface smoothness of ⅛ in. in 16 ft. must be obtained on the asphaltic concrete surface prior to spreading the asphaltic emulsion seal coat.

The portland cement concrete pavement recommended by the consulting engineers consists of a 10 in. standard type concrete pavement, using air-entraining cement, on a 6 in. base of aggregate, both resting on a subbase 20 in. thick of which 18 in. (the Grade A and Grade B courses previously mentioned) is being constructed under the grading contracts. Control joints will be spaced about 78 ft. apart. They will be made of the heartwood of selected woods in nominal ⅛ in. thickness extending from the bottom of the slab to within ¾ in. below the surface. Dowels are to be of 1¼-in. round steel, of corrosion resistant metal or with equivalent protection, held true in a rigid frame and meeting the performance specifications of the New Jersey Highway Department. Joints will be filled with a rubber latex joint filler to within ¼ in. below the surface. Tie bars will be ½ in. round by 30 in. long at 26 in. centers. Tie bars will be used on weakened plane, construction, or longitudinal joints. Distributed steel will be used 2 to 3 in. below the surface in the 78 ft. slabs, and will average 5.6 lb. per sq. yd. of pavement; however, lesser amounts are used at the slab ends and heavier in the center. Six sacks of air-entraining cement will be used per cubic yard of concrete. Slump required will be 1 in. or less and preliminary finishing will be held to a minimum. The completed surface must not vary more than ⅛ in. in 16 ft. High points must be removed by abrasive means.



★ Functional engineering organization diagram for the New Jersey Turnpike Authority.

The table below summarizes the standards on which the preliminary design of the northern division is based; the southern division is practically the same except that the design speed is 75 mph.

Design speed	
North of Wood Avenue (Elizabeth, N. J.)	70 mph. except sight distance limits to 60 mph. on Passaic and Hackensack R. Bridges
South of Wood Avenue (Elizabeth, N. J.)	70 mph.
Minimum sight distance (75 mph.)	700 ft.
Minimum length of vertical curves	600 ft.
Minimum length of horizontal curves	3,000 ft.
Radius of horizontal curves, where at all feasible	10,000 ft.
Minimum distance between same direction horizontal curves	2,500 ft.
Superelevation varies from 3% for a 3,000 ft. radius to 1% for a 10,000 ft. radius, over 10,000 ft.—none.	
Minimum distance between reverse curves	
In rural areas	1,000 ft.
In urban areas	800 ft.
Minimum radius on ramps	125 ft.
Maximum grade on Turnpike	3.0%
Maximum grade on ramps	
Up	5.5%
Down	5.0%
Minimum grade on Turnpike	0.5%
In meadows	0.0%
Traffic lane width	12 ft.

Right shoulder improved width	10 ft.
Total width	16 ft.
Left shoulder width	5 ft.
Acceleration and deceleration lanes	
Length	1,200 ft.
Width	12 ft.
Centerstrip, edge to edge of pavement	
South of Route 35	26 ft.
North of Route 35	20 ft.
Large bridges	6 ft.
Minimum vertical clearance	15 ft.
Normal width of right of way North portion	250 ft.
Normal width of right of way South portion	300 ft.
Guard rails on fills	10 ft. or over
Fill slopes	
Over 10 ft. in height	1 on 2
Less than 10 ft. in height	1 on 4
Loading on highway bridges	H20-S16
Distance between curb and railing on big bridges (open grating)	3 ft.
Horizontal clearance from right edge of pavement to structures	12 ft.
Bridge rail height over slab, view unobstructed	3½ ft.

Traffic Lanes

Beginning at the south end, the Turnpike will be a 4-lane divided highway, two lanes in each direction to State Route 35 interchange; however, structures built over the route on north from North Camden will be wide enough to accommodate two additional lanes, to permit of a 6-lane divided highway in the future.

From Route 35 interchange to Route 3 interchange, the Turnpike will be built as a 6-lane divided highway (3 lanes in each direction). Where 6 lanes are constructed initially, overhead structures will be built to accommodate a future 8-lane turnpike of the dual-dual type; meaning that there may be four (4) 2-lane roadways in each direction, each of the four roadways to be separated from the other by median strips.

From Route 3 interchange to the northerly terminus of the Turnpike at Route 6 interchange, a 4-lane divided highway will be constructed, with provision in the overhead structures for future 6-lane divided construction. An accompanying line drawing shows half of one type of interchange.

Sand Drains

Terrain through the north Jersey meadows is tidal, with a few exceptions, and consequently muddy and silty. On the south division there are also a couple of these places. The deep, soft mud, varying from a few feet to very substantial amounts, 60 to 100 ft. in depth, constitutes a major problem not usually encountered in ordinary highway construction. Adjacent to the Turnpike location, the mud depths run down to 200 ft.

To stabilize the mud and give it suitable supporting power, vertical sand drains are being constructed.

In this connection it is interesting to note that at some prehistoric age, a wooded area of cedar trees existed at what is now a firmer formation below the present surface. The vertical sand drains, in places, are being pushed through these huge cedar stumps to the firmer strata below.

An accompanying isometric chart shows the location of the drains with respect to the Turnpike fills. Another line drawing shows the zoning upon which construction procedure is based, and estimated subsidence of the original meadow surface. In one place the substrata pore pressure ran as high as 35 lb. per sq. in. Fill overloads, usually in the nature of 4 to 6 ft. over the proposed soil substructure, necessarily had to remain in place for considerable time to allow escape of the occluded water and reduction of the pressure.

Between the Passaic and the Hackensack River Bridges the meadow consists of two layers of compressible soil, a very soft peat and organic clay at the surface, and a soft varved silt and clay formation separated from the peat by 2 to 15 ft. of firmed clay, silt, and fine sand. The depth of the meadow muck runs from 60 ft. at the Passaic River to approximately 100 ft. at Belleville Turnpike crossing, becoming shallower, about 70 ft. in depth, at the Hackensack River. The submerged firmed crust, the engineers report, will support, without displacement, the low roadway fills required between the bridge approaches. Stabilization of the upper marsh mat and very soft clay will be required, of course. Usually large diameter (18 in. to 22 in.) vertical drains at wider spacings (10 to 14 ft.) are used for the shallower depths, the smaller diameters (14 to 18 in.) closer together (6 to 8 ft.) being used in deeper mud. Stabilization of the soft clay and silt *below* the crust is being accomplished under the heavy fill approaches to structures which range up to 60 ft. in height.

Zone Classifications

For purposes of discussion, design, and construction, the typical highway

Consulting Engineers on the Turnpike

Section 1. J. E. Greiner Co., 1201 St. Paul St., Baltimore 2, Md. Project Manager, B. W. LeSueur. Field Office: Resident Engineer, Ellis P. Root, 12 Ashton Rd., Swedesboro, N. J. (Roadway & Structures).

Section 2. Gannett Fleming Corddry & Carpenter, Inc., 600 N. 2nd St., Harrisburg, Pa. Project Manager, Frank J. Williams. Field Office: Project Engineer, Harold A. Blauvelt, General Del., Barrington Airport, Barrington, N. J. (Roadway & Structures).

Section 3. Parsons, Brinckerhoff, Hall & Macdonald, 51 Broadway, N. Y. 6, N. Y. Project Manager, J. E. Everson. Field Office, Resident Engineer, S. A. Trevarthen, General Delivery, Burlington, N. J., Columbus-Burlington Rd., 2 miles west of Columbus. (Roadway & Structures).

Section 4. DeLeuw, Cather & Co., 150 N. Wacker Drive, Chicago 6, Ill. Field Office, Resident Engineers, Fred Simpson (Cont. 9B) and F. Bosworth (Cont. 9A); Project Manager, R. B. Richards; Project Engineer, Q. Fletcher; Asst. Project Engineer, J. Ritchie. (Roadway & Structures).

Section 5. Fay, Spofford & Thorndike, 11 Beacon St., Boston, Mass. Field Office: Project Manager, B. K. Beebe, P. O. Box 746, 25 Livingston Ave., New Brunswick, N. J. (Roadway & Structures).

Section 6. Ammann & Whitney, 76 Ninth Ave., N. Y. 11, N. Y. Project Manager, Milton Brumer. Field Office: Northern Section, Resident Engineer, H. M. Simmons, 185 Raymond Boulevard, Newark, N. J. Southern Section, Resident Engineer, Nomer Gray, temporary address, 3 Williars St., Newark, N. J. (Structures Only).

Section 7. Howard, Needles, Tammen & Bergendoff, 55 Liberty St., N. Y. Project Manager, James J. Exum. Field Office: Resident Engineer, L. D. Brown, Box 4, Rutherford, N. J. (Structures Only).

Sections 6 & 7. Edwards, Kelcey, Frederic R. Harris, Inc., and O. J. Porter & Co., Assoc., 3 William St., Newark, N. J. Project Engineer, Dean Edwards; Chief Engineer, Wm. L. Hanavan. Field Office: Resident Engineers, Jack E. Cowles, New County Rd., Secaucus, N. J.; P. C. MacCallum, Erie R.R. Y.M.C.A., Secaucus, N. J., and Belleville Turnpike, Kearny, N. J.; L. J. Stephenson, 332 Bayway Ave., Elizabeth, N. J. (Roadway Only).

All Sections—General Consultants. Col. E. R. Needles, Managing Partner; Howard, Needles, Tamman & Bergendoff. Field Office: Project Engineer, C. H. Peterson; Office Engineer, L. E. Olson; 9 Witherspoon St., Princeton, N. J.

★ Sand drain rig in operation. Note two heavy compressors mounted on single frame with crawler treads. Also headlights for around-the-clock work.

★ Base of sand drain core. Shadow of man's left leg crosses over the loose base plate or flap valve on bottom end of core. Driver getting set to punch a new hole.

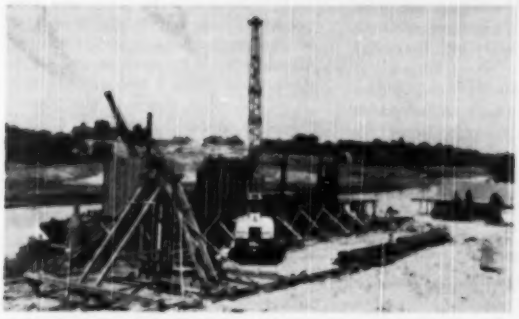
Seen Along the N. J. Turnpike

★ Shovel and bottom-dump wagon work south of the Raritan River. Four dipper loads filled a wagon.

★ Four 150-cfm. compressors hooked together furnish air for core hammers in pile driver leads for the two sand drain rigs shown on second page of this article.

★ Elevating loader fills dump wagons at rate of one every 25 seconds in this excellent soil on one of Brewster's jobs.

★ Raritan River crossing piers are poured from complete concrete mixing plant mounted on a barge. Entire pier built from barges.



★ Close-up of cranes swinging sheet piling into place for pier of 712 ft. bridge over Rancocas Creek. The framework in the foreground is a guide frame which is used for aligning precast piles. Contractor: Union Building & Construction Company. (At right): High-speed earthmoving on Savin Construction Corp. job.

★ Hundreds of heaviest model tractors have been employed as the "backbone" of several of the turnpike contracts.

★ Rock excavation on 2nd bench left of Laurel Hill. Power shovel and trucks handle excavation.

★ Scraper operation on Grandview Construction Company job near East Brunswick.

fill cross-section in the tidal flat sections has been divided into zones as follows:

Zone 1

Three to four feet, as required, of pervious clean sand blanket placed directly on the mud. Water being squeezed out of the muck below will escape upward through the vertical sand drains and horizontally out to the flats through this pervious blanket

Zone 2

Approximately 3 to 4 ft. of fill material is placed on top of the sand blanket as a working platform for the equipment used to install the vertical sand drains.

Zone 3

This zone extends vertically above Zone 2 to the template grade of the fill.

Zone 4

This zone consists of the two courses, base and sub-base materials with additional thickness of base material added during fill construction. It varies between three and four feet in thickness.

Zone 5

This is the overload material placed to consolidate the muck below the original ground line. It is later removed and used to dress side slopes.

A special case at Laurel Hill where rock is being used as fill material, required the establishment of 3 more zones as follows:

Zone 6

Zone 6 is an area of broken rock near the Laurel Hill excavation with chunks no larger than 2 ft. in diameter, within the limits of the fill area from the shoulder line down on a ½ to 1 slope. It is placed on Zone 1 material. Any sand drains that were required were constructed from the surface of the Zone 1 material.

Zone 7

This area is located along the outside edge of Zone 6 and consists of rock larger than 2 ft. in diameter. It is in somewhat the position of a fill toe load yet within the 2:1 slope from the shoulder of the fill down to Zone 1 material.

Zone 8

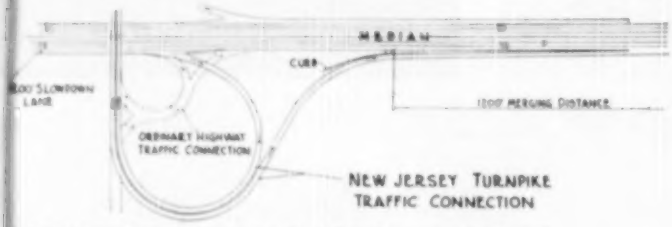
This zone is 2 ft. thick and composed of rock not larger than 6 in. in diameter sluiced with additional fill material. It is superimposed on the Zone 6 and Zone 7 material and goes on a 2:1 slope down to the Zone 1 material. Zone 4 and Zone 5 materials are placed on top of the Zone 8 material.

Sand Drain Construction Procedure

Power cranes equipped with about 120-ft. pile leads which contain automatic steam type hammers are used to drive the sand pile core or mandril; however, compressed air at 150 psi. pressure is used instead of steam to operate the pile hammers. On one of contractor George M. Brewster's locations two diesel powered cranes with driving leads, working separately, are hooked up by means of 4 in. I.D. armored rubber hoses to a common 6 in. steel pipe header that furnishes compressed air from four large 150 c.f.m. portable compressors tied into it.

The sand pile core (mandril) is a steel pipe of required diameter and length, approximately 100 ft., arranged with a driving head and a side opening near the top into which a skip load of clean sand may be dumped after the core is driven to firm foundation below. The bottom of the mandril is covered with a base plate hinged by means of wire cable so that it will open up when the core is pulled. As the core is pulled with about 100 lb. per sq. in. of air pressure applied inside of the mandril the sand remains in place, creating a vertical drain. Having been driven from Zone 2 it has already penetrated the sand blanket (Zone 1) and thus a free draining condition is created.

Settlement platforms are installed at certain places on the mud flat be-



★ Typical interchange design for the N. J. Turnpike, compared with traditional designs.

★ Artist's conception of the Turnpike's Toll Interchange at New Jersey Route 35.

fore Zone 1 is placed, in order to measure the consolidation that has occurred. Laboratory consolidation tests of the deep muck guide the engineers in their determination on size of overload to place, how long it must remain in place, size and spacing of sand drains, and depth of drains.

Contract Work

Intense effort was applied to get all of the Turnpike work under contract as rapidly as possible. An accompanying table shows, by sections, some data in this regard. These data are as of the end of July. Another table shows the home addresses and field offices addresses of contractors which had established same by the end of July. A table showing prices bid by two lowest bidders at one letting is included to show average prices of work.

Man-Made Problems on the New Jersey Turnpike

1.—With the Railroads.

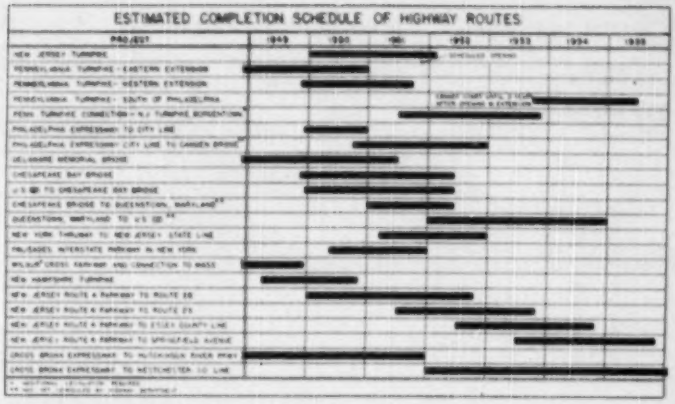
(a) The modern trend is toward greater vertical clearances in bridges for railroad operations. The majority of railroads requested a 22'0" vertical clearance for steam driven locomotives and 23'0" for diesel or electrically driven ones. Several roads are at present requesting 26'0" vertical clearances on their electrically driven lines. This is especially where the catenary system is used.

During negotiations with several roads whose vertical bridge clearances ranged from 16'0" to 22'0", they insisted upon 23'0" and at that moment were building their own bridges with a 21'0" vertical clearance.

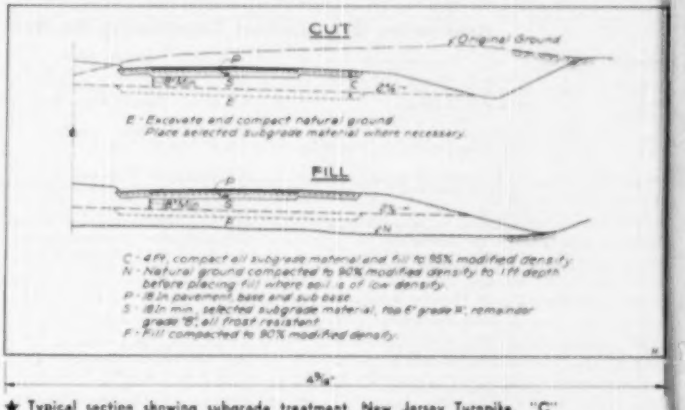
(b) There was little or no trouble with the railroads over horizontal clearances.

(c) Railroads operating with a single track immediately requested bridges wide enough to allow them to build an additional track for future expansion. Several of these branches have been problems to the railroads for a number of years because of a lack of profitable traffic and the officials have seriously thought that they should obtain permission to abandon them.

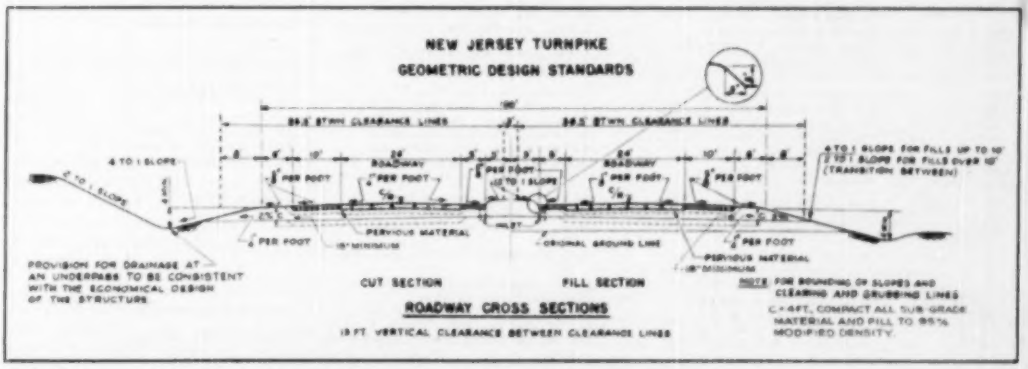
Those roads having double tracks requested bridge widths for four tracks, and two railroads having double tracks requested that the Authority provide for an expansion for



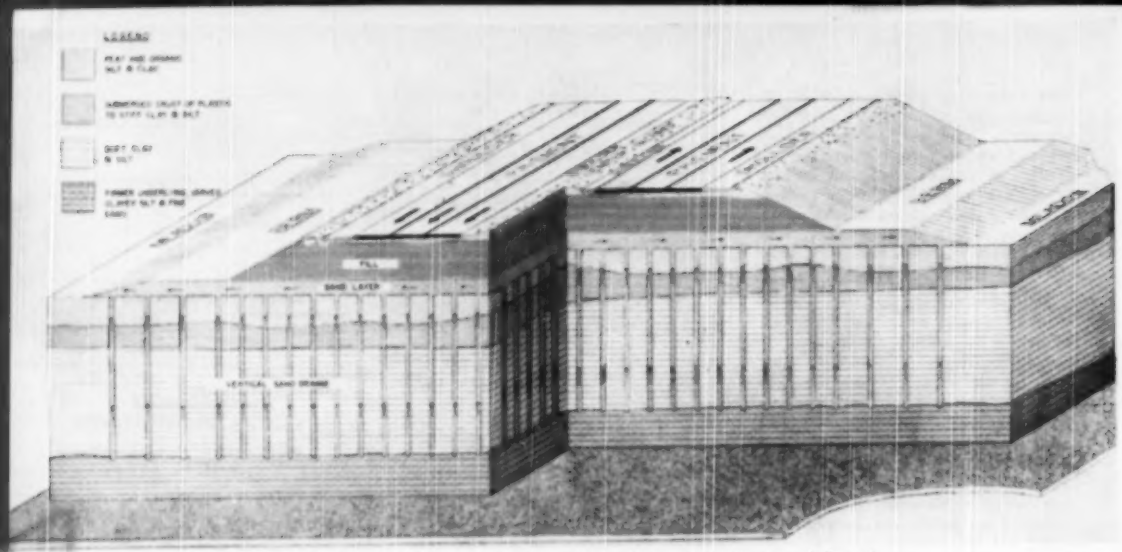
★ The race is on! Graphical time schedules for various turnpike and arterial projects in Eastern U. S.


CUT
Original ground
E - Excavate and compact natural ground. Place selected subgrade material where necessary.
FILL
C - 4 Ft. compact all subgrade material and fill to 95% modified density.
N - Natural ground compacted to 90% modified density to 1 Ft. depth before placing fill where soil is of low density.
P - 8 In pavement base and sub base.
S - 18 In min. selected subgrade material, top 6" grade A; remainder grade B; all frost resistant.
F - Fill compacted to 90% modified density.

★ Typical section showing subgrade treatment, New Jersey Turnpike. "C" shows 4-ft. compacted subgrade and fill to 95% modified AASHO density.


NEW JERSEY TURNPIKE
GEOMETRIC DESIGN STANDARDS
ROADWAY CROSS SECTIONS
CUT SECTION
FILL SECTION
PROVISION FOR DRAINAGE AT UNDERPASS TO BE CONSISTENT WITH THE ECONOMICAL DESIGN OF THE STRUCTURE
NOTE FOR ROUNDING OF SLOPES AND CLEARING AND GRUBBING LINES
C - 4 FT. COMPACT ALL SUB-GRADE MATERIAL AND FILL TO 95% MODIFIED DENSITY.

★ Typical geometrical cross-section details of 4-lane roadway for the Turnpike.



★ Cutaway section of vertical sand drain stabilization beneath heavy fills. Arrows show direction of flow of water to and from the drains during filling and overloading period.

ous tracks.

(b) During preliminary discussions with the officials of a number of railroads, drawings were shown that dated back in the early teens, to prove that they had planned expansions for yards and lines especially in the metropolitan areas, forty odd years ago.

The question of development for future passenger service, and service in the suburban districts for smaller industrial plants was continually

Contracting Organizations Constructing the New Jersey Turnpike

Contract	Section	Contractor	Home Address	Field Address*
1	6	Poirier & McLane Corporation	33 West 42nd St., N. Y. 18, N. Y.	320 Mack St., Elizabeth, N. J.
2	6 & 7	Geo. M. Brewster & Son	275 Fort Lee Rd., Bogota, N. J.	48 Stuyvesant Ave., Lyndhurst, N. J.
3	1	S. J. Groves & Sons	509 Wesley Temple Bldg., Minneapolis, Minn.	P. O. Box P, Swedesboro, N. J.
4	5	Severin, Preston & Burrows, Inc.	50 Church St., New York, N. Y.	
5	6	The Underpinning & Foundation Co., Inc.	155 E. 44th St., New York, N. Y.	Raymond Blvd. & Blanchard St., Newark, N. J.
6	7	R. H. Jaggard Eng. Co.	Highland Ave., Westmont, N. J.	Laurel Hill, Secaucus, N. J.
7	2	Savin Construction Corp.	10 Village St., East Hartford 8, Conn.	P. O. Box 58, Huddon Heights, N. J.
8	3	Geo. M. Brewster & Son	275 Fort Lee Rd., Bogota, N. J.	Box 242, Burlington, N. J.
9	4	Grandview Construction Corp.	740 South Fulton Ave., Mt. Vernon, N. Y.	P. O. Box 254, Hightstown, N. J.
10	5	Villa Contracting Co.	233 North Ave., Westfield, N. J.	P. O. Box 273, Nixon, N. J.
11	7	Geo. M. Brewster & Son	275 Fort Lee Rd., Bogota, N. J.	New County Rd., Secaucus, N. J.
12	5	Lisk-Griffith Construction Co.	152 Passaic St., Newark, N. J.	c/o N.J.T.A. Roosevelt Ave., Cartaret, N. J.
13	6	The Napp-Grecco Co.	241 Riverside Ave., Newark, N. J.	205 Bayway Ave., Elizabeth, N. J.
14	6	Geo. M. Brewster & Son	275 Fort Lee Rd., Bogota, N. J.	181 Raymond Blvd., Newark, N. J.
15	6	Del Bake Construction Corp.	580 Zerega Ave., Bronx 61, N. Y.	Box 182, Elizabeth, N. J.
16	7	Cuyuga Foundation Corp.	30 Verney St., New York 7, N. Y.	General Delivery, Secaucus, N. J.
17	7	American Bridge Co.	71 Broadway, New York, N. Y.	
18	7	Geo. M. Brewster & Son	275 Fort Lee Rd., Bogota, N. J.	New County Rd., Secaucus, N. J.
19	6	Construction Aggregates & Peter Kiewiet & Sons Co.	1 East 42nd St., New York, N. Y.	
20	6	Bath'chem Steel Co.	701 East Third St., Bethlehem, Pa.	
21	4	P. T. Cox Construction Co., Inc.	270 Broadway, New York 7, N. Y.	General Delivery, Hightstown, N. J.
22	6			
23	4	Brookfield Construction Co.	521 Fifth Ave., New York, N. Y.	c/o Cadell, Jamesburg, N. J.
24	1	Peerless Construction Co.	350 W. 42nd St., New York, N. Y.	
25	6	Poirier & McLane Corp.	33 West 42nd St., New York 18, N. Y.	320 Mack St., Elizabeth, N. J.
26	7	Union Building & Construction Co.	631 Main Ave., Passaic, N. J.	
27	2	Savin Construction Co.	10 Village St., East Hartford 8, Conn.	P. O. Box 58, Haddon Heights, N. J.
28	3	Union Building & Construction Co.	631 Main Ave., Passaic, N. J.	P. O. Box 138, Moorestown, N. J.
29	4	Brookfield Construction Co.	521 Fifth Ave., New York, N. Y.	c/o Cadell, Jamesburg, N. J.
30	5	Harris Structural Steel Co., Inc.	419 Fourth Ave., New York 16, N. Y.	
31	6	Grow Construction Co.	313 West 53rd St., New York, N. Y.	
32	6	The Napp-Grecco Co.	241 Riverside Ave., Newark, N. J.	205 Bayway Ave., Elizabeth, N. J.
33	2	Francis A. Canuso & Son	804 So. 12th St., Philadelphia, Pa.	P. O. Box 203, Ashland, N. J.
34	5	John Rosenblum, Inc.	1860 Broadway, New York 23, N. Y.	P. O. Box 269, Woodbridge, N. J.
35	7	Koppers Co., Inc.	P. O. Box 298,200 Scott St., Baltimore, Md.	
36	3	Geo. M. Brewster & Son	275 Fort Lee Rd., Bogota, N. J.	Box 242, Burlington, N. J.
37	3	Conduit & Foundation Corp.	770 South Schuylkill Ave., Phila., Pa.	
38	5	Brann & Stuart Co.	Room 771 Broad St., Station Bldg., Phila., Pa.	
39	6	Koppers Co., Inc.	P. O. Box 298,200 Scott St., Baltimore, Md.	
40	4			
41	4	Construction Service Co.	Lincoln Blvd., Board Brook, N. J.	
42	–	H. L. Harrison & Son., Inc.	Westfield, N. J.	
43	2	Francis A. Canuso & Son	804 So. 12th St., Philadelphia, Pa.	P. O. Box 203, Ashland, N. J.
44	7	Peerless Construction Co.	350 W. 42nd St., New York, N. Y.	
45	5	S. J. Groves & Sons Co.	509 Wesley Temple Bldg., Minneapolis, Minn.	State Hwy. 35, Woodbridge, N. J.

*If no address shown, field office not established as of August 1, 1950.

brought to the attention of turnpike engineers.

(e) As would be expected the railroads, with few exceptions, generally required formal agreements with the Turnpike Authority before contractors were permitted right of entry. Problems of insurance, damage, track removal, etc., had to be settled before entering railroad property. This caused many delays.

In several instances, an aggressive contractor who decided not to wait for a formal right of entry was very much surprised to see the police driving his men off the railroad right-of-way.

(f) The contractor rather than crossing railroad tracks in order to haul cut material to the fill area had to make long, roundabout hauls. Crossing the tracks could have been very serious from a standpoint of safety, because the majority of the turnpike crossings are main line ones.

(g) A number of railroads were very cooperative but as usual there appeared to be some difference of opinion between their various legal departments and their engineering departments; not an uncommon condition even within highway departments. This necessarily caused a great amount of delay and coupled with the red tape created quite a problem to the Turnpike Authority.

In some instances it was felt that there was procrastination on the part of the railroads, and when this was brought out during negotiations representatives of the Authority were told that the railroads were not in sympathy with the project, because it would take considerable business away from the railroads, and that the Authority naturally should not look for a great amount of cooperation from them.

(h) In an endeavor to keep the railroad spans down to a minimum a very great problem presented itself. Several railroad yards had to be moved to new locations, property had to be purchased in order to accomplish this. Buildings had to be replaced and this alone was an expensive operation. Streets had to be closed and naturally the various city and county officials from a political standpoint felt compelled to raise a "hue and cry" in order to prove to their voters that they were protecting the municipality or county from encroachment by the Authority.

2.—In order to combat local opposition, the three members of the Turnpike Authority, who serve without salary, appeared before the officials of each county and at the same time invited the officials of every city, town, boro and township, where the turnpike was to be located, in order to hear their protests and to explain the necessity for the location of the turnpike. From time to time they met opposition. One of the larger cities brought court action against the alignment, but the courts disallowed their action.

The towns in the vicinity of the turnpike line, but not directly affected by it, requested a change in the line in order that it might go through their area.

3.—There are 258 structures on the New Jersey Turnpike, built for the convenience of the traveling public. It was impossible economically to design grade separations for every road which the turnpike crossed. The Turnpike Authority met considerable opposition from citizens and local officials, when it was announced which minor roads were to be closed. This meant more hearings, and the Turnpike Authority had a representative meet with every group, to hear their complaints before arriving at a final conclusion as to the definite line for the turnpike.

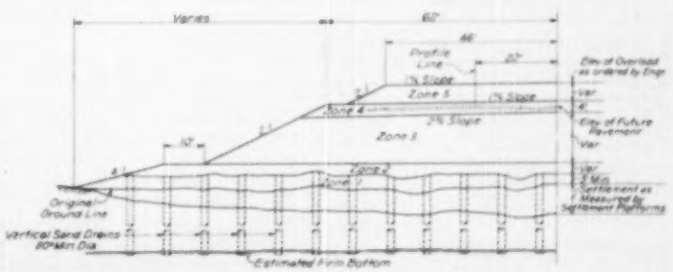
4.—After the line was established there came the demand for bridges, much wider than was justified by present road dimensions and traffic demands. The Turnpike Authority

(*Continued on page 49*)

Typical Unit Bid Prices for N. J. Turnpike Job

Bid Items and Quantities		(Low Bidder) Grandview Construction Corp. Mount Vernon, N.Y.	(Second Bidder) Savin Construction Corp. E. Hartford, Conn.
Lump	Protection of Railroad Traffic		
Lump	Clearing and Grubbing		
2,869,000	Cu. Yd. Roadway Excavation, Earth	0.53	0.55
350	Cu. Yd. Roadway Excavation, Rock	4.00	5.00
60,000	Cu. Yd. Roadway Excavation, Muck	0.55	0.25
75,000	Cu. Yd. Half-Mile Overhaul	0.07	0.07
700,000	Cu. Yd. Borrow Excavation	0.37	0.36
5,100	Cu. Yd. Porous Fill	1.00	1.00
1,700	Cu. Yd. Channel Excavation	1.00	1.00
2,900	Cu. Yd. Open Foundation Excavation	2.00	3.00
200	Cu. Yd. Sand Backfill Under Footings	5.00	2.00
400,000	Sq. Yd. 4-in. Topsoiling	0.25	0.30
2,100	Cu. Yd. Concrete in Culverts	50.00	50.00
235,000	Lbs. Reinforcement Steel (Specified Type)	0.10	0.10
5,900	Lin. Ft. Treated Timber Bearing Piles	2.30	2.00
6,100	Lin. Ft. 10-in. Underdrains, Type F	3.50	3.00
1,500	Lin. Ft. 12-in. Underdrains, Type F	4.00	3.50
15	Lin. Ft. 18-in. R.C.P. Standard Strength	5.00	4.50
1,470	Lin. Ft. 24-in. R.C.P. Standard Strength	6.45	6.00
615	Lin. Ft. 30-in. R.C.P. Standard Strength	9.25	8.00
295	Lin. Ft. 42-in. R.C.P. Standard Strength	14.75	14.00
550	Lin. Ft. 48-in. R.C.P. Standard Strength	16.50	17.00
940	Lin. Ft. 54-in. R.C.P. Standard Strength	22.30	21.00
170	Lin. Ft. 72-in. R.C.P. Standard Strength	38.50	35.00
200	Lin. Ft. 24-in. R.C.P. Extra Strength	6.80	6.50
320	Lin. Ft. 30-in. R.C.P. Extra Strength	9.45	8.50
210	Lin. Ft. 36-in. R.C.P. Extra Strength	11.60	12.50
260	Lin. Ft. 54-in. R.C.P. Special	23.70	25.00
1,790	Lin. Ft. 18-in. Storm Drain, R.C.P. or C.M.P.	5.00	4.30
2,480	Lin. Ft. 24-in. Storm Drain, R.C.P. or C.M.P.	6.45	5.00
165	Lin. Ft. 30-in. Storm Drain, R.C.P. or C.M.P.	9.25	7.00
105	Lin. Ft. 42-in. Storm Drain, R.C.P. or C.M.P.	14.75	14.00
9,000	Cu. Yd. Gravel Surface Course	1.25	1.50
35	Tons Calcium Chloride	63.00	60.00
500	Sq. Ft. Creosoted Timber Sheet Piling	2.00	1.50
6,500	Lin. Ft. Temporary Cattle Fence	0.40	0.30
Lump	Final Cleaning Up		
	Total	$1,433,581.00	$1,490,157.00

Other Bids			
S. J. Groves & Son	$1,550,822.50	D. W. Winkleman Co.	1,706,995.00
Davis Construction Corp.	1,558,358.00	Geo. M. Brewster	1,843,269.00
		Villa Contracting Co., Inc.	2,324,037.00



★ Typical embankment greater than 10 ft. high, with sand drains.

Details of Construction Contracts on the New Jersey Turnpike

Approximate quantities for principal bid items on various "heavy" contracts, let to Aug. 1, 1950

No. 1, Sec. 6-7. Grade, drain, minor structures. Awarded 1-19-50 to Peirce & McLane, N.Y.C.; $1,-968,730.
- 675,000 cu.yd. excv. & grading
- 218,000 lin.ft. sand drains
- 5,800 cu.yds. concrete
- 160 tons structural steel
- 92 tons rein. steel

•

No. 2, Sec. 6-7. Grade, drain. Awarded 2-10-50 to George M. Brewster & Son, Bogota, N. J.; $1,884,050.
- 4,400 cu.yd. muck excv.
- 10,000 cu.yd. roadway excv. common
- 788,000 cu.yd. borrow excv.
- 4,500 cu.yd. channel excv.
- 1,800 sq.yd. rubble gutter
- 600,000 lin.ft. sand drains

Lump Sum cleaning up

•

No. 3, Sec. 1, Grade, drain, 28 structures. Awarded 4-25-50 to E. J. Groves & Sons Co., Woodbridge, N. J.; $8,605,758.
- 143 acres clearing & grub.
- 4,192,650 cu.yd. excv. & grading
- 949,000 cu.yd. compaction of in-place material
- 768,000 sq.yd. topsoiling
- 5,100 cu.yd. gravel course
- 119 tons calcium chloride
- 23,685 cu.yd. concrete
- 3,249,800 lbs. rein. steel
- 12,495 lin.ft. rein. concrete pipe, various sizes
- 2,500 lin.ft. corrugated metal pipe, various sizes
- 600,000 lbs. structural steel
- 76,100 lin.ft. concrete piles

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No. 4, Sec. 5. Raritan River Bridge Structure. Awarded 2-10-50 to Merritt, Preston & Burrows, Inc., N.Y.C.; $368,374.
- 3,300 cu.yd. open found. excv.
- 1,000 cu.yd. concrete, underwater
- 3,800 cu.yd. concrete, in the dry Cofferdam work
- 342,000 lbs. steel bearing piles
- 150,000 lbs. rein. steel
- 2,100 cu.ft. granite masonry

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No. 5, Sec. 6. Passaic Riv. Bridge, Main span piers. Awarded 2-10-50 to Underpinning & Foundation Co., N.Y.C.; $680,285.
- 3,060 cu.yd. foundation excv.
- 7,490 cu.yd. concrete in foundations, pedestals & pier bents
- 5,650 cu.ft. granite masonry
- 735,000 lbs. rein. steel

Lump Sum fenders

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No. 6, Sec. 7. Hackensack River Bridge, River Piers. Awarded 2-10-50 to R. H. Jaquard Engineering Co., Westmont, N. J.; $1,226,910.
- 16,160 cu.yd. concrete
- 350,000 lbs. rein. steel
- 52,600 lin.ft. steel piles
- 12,160 cu.ft. granite masonry
- 18,400 lin.ft. treated piles
- 85 M. ft. B.M. connected timber

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No. 7, Sec. 2. Grade, drain. Awarded 3-22-50 to Savin Construction Corp., E. Hartford, Conn.; $3,-891,484.
- 4,950,000 cu.yd. excv. & grading
- 1,450,000 cu.yd. borrow excv.
- 676,000 cu.yd. compaction of in-place material
- 900,000 sq.yd. topsoiling
- 6,610 cu.yd. concrete
- 48,200 lin.ft. timber pile
- 16,400 lin.ft. storm drains
- 26,000 sq.yd. pavements
- 702,000 lbs. rein. steel

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No. 8, Sec. 5. Grade, drain. Awarded 2-21-50 to George M. Brewster & Son, Bogota, N. J.; $2,477,738.
- 37 acres clearing & grubbing
- 3,783,400 cu.yd. excv. & grading
- 541,800 sq.yd. topsoiling
- 210 cu.yd. concrete
- 50,800 lbs. rein. steel
- 10,150 lin.ft. conc. pipe, var. sz.
- 1,530 lin.ft. underdrains, var. types & sz.

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No. 9, Sec. 4. Grade, drain. Awarded 2-28-50 to Grandview Construction Co., Mt. Vernon, N.Y.; $2,716,065.
- 4,394,000 cu.yd. excv. & grading
- 790,000 sq.yd. topsoiling
- 3,000 cu.yd. concrete
- 370,000 lbs. rein. steel
- 3,270 lin.ft. precast concrete bearing piles
- 24,800 lin.ft. underdrains
- 18,520 lin.ft. concrete pipe culverts, var. sz.
- 4,210 lin.ft. corrugated metal pipe culverts
- 16,700 cu.yd. gravel surface

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No. 10, Sec. 5. Grade, drain. Awarded 3-16-50 to Villa Contracting Corp., Inc., Westfield, N. J.; $1,776,420.
- 146 acres clearing & grub.
- 2,180,000 cu.yd. roadway excv.
- 2,400 cu.yd. road excv., rock
- 197,000 cu.yd. road excv., muck
- 10,000 cu.yd. open found. excv.
- 1,900,000 cu.yd. embankment, compacted
- 310,000 sq.yd. 4-in. topsoiling
- 11,350 cu.yd. concrete, Class B for culverts
- 9,580 lin.ft. rein. concrete pipe, var. sz.
- 11,700 lin.ft. other drain pipe, metal, clay and plain concrete, var. sz.

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No. 11, Sec. 7. Grade, drain. Awarded 2-21-50 to George M. Brewster & Son; $1,954,920.

Lump Sum clearing and grubbing
- 20,000 cu.yd. roadway excavation, earth
- 128,000 cu.yd. road excv., rock
- 38,000 cu.yd. road excv., muck
- 1,113,000 cu.yd. borrow excv.
- 56,000 lin.ft. sand drains
- 1,084 lin.ft. rein. concrete culvert pipe storm drains

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No. 12, Sec. 5. Rahway Riv. Bridge Structure. Awarded 2-21-50 to Linde-Griffith Construction Corp., Newark, N. J.; $668,879.
- 2,600 cu.yd. open found. excv.
- 1,450 cu.yd. concrete, underwater
- 2,150 cu.yd. concrete, in the dry Cofferdam work
- 315,000 lbs. steel bearing piles
- 265,000 lbs. rein. steel
- 11,300 cu.ft. granite masonry

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No. 13, Sec. 6. Grade, drain. Awarded 3-28-50 to George M. Brewster & Son; $1,328,095.
- 32,000 cu.yd. road excv., muck
- 14,000 cu.yd. road excv., earth
- 750,000 cu.yd. borrow excv.
- 33,500 lin.ft. sand drains
- 2,540 lin.ft. storm drains

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No. 14, Sec. 6. Passaic Riv. Bridge Approach piers. Awarded 3-28-50 to George M. Brewster & Sons; $3,615,940.
- 101,000 cu.yd. constr. roads
- 30,530 cu.yds. found. excv.
- 20,700,000 lbs. furnish steel piles
- 259,500 lin.ft. driving steel piles
- 39,500 lin.ft. pile coating
- 2,200 lin.ft. concrete encasement of steel piles
- 35,730 cu.yd. concrete in pile caps, piers and abut.
- 3,600,000 lbs. rein. steel

Protection of railroad traffic—lump sum

Protection of public service property—lump sum

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No. 15, Sec. 6. Morses Creek Bridge and Railroad Ave. Viaduct. Awarded 4-11-50 to Del Balso Construction Corp., Bronx, N. Y.; $1,-861,740.
- 11,000 cu.yd. fill
- 11,100 cu.yd. open found. excv.
- 30,000 lin.ft. untreated piles
- 4,160 lin.ft. precast piles
- 9,500 cu.yd. concrete in abutments, wingwalls, piers and bents
- 2,999 cu.yd. concrete in deck slabs, safety walks and parapets
- 5,500,000 lbs. structural steel
- 1,600,000 lbs. rein. steel
- 2,200 lin.ft. metal railings

Lump Sum Protection of Railroad traffic

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No. 16, Sec. 7. Hackensack Riv. Bridge Approach Piers. Awarded 4-3-50 to Cayuga Foundation Corp., N.Y.C.; $1,629,230.
- 1,018 cu.yd. open foundation excv. rock
- 10,900 cu.yd. open foundation excv. other than rock
- 15,830 cu.yd. concrete
- 1,340,000 lbs. rein. steel
- 105,200 lin.ft. steel piles
- 66,000 cu.yd. borrow excv.

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No. 17, Sec. 7. Hackensack Riv. Bridge Superstructure. Awarded 5-10-50 to American Bridge Co., N.Y.C.; $6,326,596.
- 20,000,000 lbs. struct. carbon steel
- 11,000,000 lbs. struct. silicon steel
- 11,400 lin.ft. metal railing
- 44,000 sq.ft. open grating

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No. 18, Sec. 6-7. Grade, drain. Awarded 5-9-50 to George M. Brewster & Son; $5,320,288.

Lump Sum Clearing & grubbing
- 362,600 cu.yd. roadway excv., earth
- 30,000 cu.yd. excv., rock
- 13,500 cu.yd. excv., muck
- 65,000 cu.yd. excv., dump
- 3,060,000 cu.yd. borrow excv.
- 1,721,300 lin.ft. sand drains
- 181,240 cu.yd. channel excv.
- 6,240 lin.ft. underdrains, var.
- 6,400 lin.ft. storm drains

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No. 19, Sec. 6-7. Grade, drain. Awarded 7-26-50 to Construction Aggregates & Peter Kiewit & Sons Co.; $3,320,878.

Lump Sum Clearing & grubbing
- 65,000 cu.yd. road excv., earth
- 8,000 cu.yd. road excv., rock
- 40,000 cu.yd. road excv., muck
- 2,054,000 cu.yd. borrow excv.
- 375,000 lin.ft. vertical sand drains
- 929 cu.yd. concrete in structures
- 12,000 lin.ft. storm drains & sewers, var. sz.

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No. 20, Sec. 6. Passaic Riv. Bridge Superstructure. Awarded 5-10-50 to Bethlehem Steel Co., Bethlehem, Pa.; $7,285,810.

Lump Sum demolition of bridges
- 10,050 lin.ft. water mains, var. sz.
- 26,500,000 lbs. struct. carbon steel
- 14,300,000 lbs. struct. silicon steel
- 422,000 lbs. castings
- 41,600 sq.ft. steel gratings
- 14,000 lin.ft. metal railings

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No. 21, Sec. 4, 17 Structures. Awarded 4-25-50 to P. T. Cox Construction Co., Inc., N. Y. C. $1,365,105.
- 10,100 cu.yd. open found. excv.
- 11,300 cu.yd. concrete
- 1,400,000 lbs. rein. steel
- 3,000,000 lbs. structural steel
- 33,600 lin.ft. concrete piles
- 6,700 lin.ft. railing
- 2,550 lin.ft. pipe drains
- 16,470 lin.ft. pipe conduit

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No. 22, Sec. 6-7. Grade, drain.
- 40,000 cu.yd. road excv., earth
- 31,000 cu.yd. road excv., muck
- 177,000 cu.yd. road excv., dump
- 2,000 cu.yd. road excv., rock
- 3,000,000 cu.yd. borrow excv.
- 630,000 lin.ft. sand drains
- 16,000 cu.yd. channel excv.
- 6,300 lin.ft. storm drains and sewers, var. sz.
- 5,000 lin.ft. water mains, var. sz.

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No. 23, Sec. 4. 12 Structures. Awarded 5-10-50 to Brookfield Construction Co., Inc., N. Y. C.; $1,354,698.
- 6,550 cu.yd. open found. excv.
- 10,200 cu.yd. concrete
- 1,260,000 lbs. rein. steel
- 4,650,000 lbs. structural steel
- 21,300 lin.ft. concrete piles
- 5,550 lin.ft. railing
- 2,470 lin.ft. pipe drains
- 13,380 lin.ft. pipe conduit

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No. 24, Sec. 1, 2 Structures. Awarded 6-15-50 to Peerless Construction Co., N. Y. C.; $281,885.
- 1,600 cu.yd. open foundation excavation
- 2,260 cu.yd. concrete
- 375,000 lbs. rein. steel
- 494,000 lbs. structural steel
- 7,200 lin.ft. concrete piles
- 1,000 sq.yd. topsoiling

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No. 25, Sec. 6. 2 Baltimore & Ohio Railroad Bridges. Awarded 6-7-50 to Peirler & McLane; $338,975.
- 8,750 cu.yd. roadway excv.
- 2,000 cu.yd. open found. excv.
- 1,200 cu.yd. Class B concrete in piers, abutment and wing walls
- 276 cu.yd. Class B concrete in deck slabs, safety walks, parapets, curbs
- 641,000 lbs. structural steel
- 161,500 lbs. rein. steel
- 610 lin.ft. metal railings
- 4,100 sq.ft. waterproofing

Lump Sum Supporting existing track and construction operations

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No. 26, Sec. 6-7. Grade, drain. Awarded 5-10-50 to Union Bldg. & Construction Corp., Passaic, N. J.; $1,838,885.
- 10,000 cu.yd. road excv., earth
- 900 cu.yd. road excv., rock
- 35,000 cu.yd. road excv., muck
- 70,000 cu.yd. road excv., dump
- 870,000 cu.yd. borrow excv.
- 588,800 lin.ft. sand drains
- 1,470 lin.ft. storm drains and sewers

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No. 27, Sec. 2. 15 Structures. Awarded 6-1-50 to Savin Construction Co.; $2,310,658.
- 54,000 cu.yd. excv. & grading
- 14,600 cu.yd. concrete
- 4,200,000 lbs. rein. steel
- 2,000,000 lbs. structural steel
- 81,000 lin.ft. concrete bearing piles
- 3,900 lin.ft. bridge railing
- 33,000 sq.yd. pavement
- 360 lin.ft. pipe drains
- 12,400 lin.ft. pipe conduit

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No. 28, Sec. 3. Rancocas River Bridge. Awarded 5-10-50 to Union Bldg. & Construction Corp.; $1,-140,145.
- 4,800 cu.yd. open found. excv.
- 10,000 lin.ft. untreated piles
- 2,400 lin.ft. treated piles
- 9,000 lin.ft. cast-in-place concrete piles
- 6,150 lin.ft. precast piles
- 9,500 cu.yd. concrete, var.
- 550,000 lbs. rein. steel
- 2,630,000 lbs. structural steel

•

No. 29, Sec. 4. 9 Structures. Awarded 6-7-50 to Brookfield Construction Co.; $1,161,069.
- 8,900 cu.yd. open foundation excv.
- 10,220 cu.yd. concrete
- 1,070,000 lbs. rein. steel
- 3,200,000 lbs. structural steel
- 32,700 lin.ft. concrete bearing piles
- 2,950 lin.ft. railing
- 1,360 lin.ft. bridge drains

660 lin.ft. storm drains
780 lin.ft. pipe conduits

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No. 29, Sec. 3. Raritan Riv. Bridge Superstructures. Awarded 5-2-50 to Harris Structural Steel Co., Inc., N. Y. C.; $848,176.
4,100,000 lbs. structural steel, fabricated, erected, completed in place
1,320 cu.yd. concrete Class B, for deck slabs and abutment balustrades
510,000 lbs. rein. steel
5,830 sq.ft. steel br. grating
1,730 lin.ft. pipe handrail
Complete System electrical work for navigation lights, channel span

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No. 31A, Sec. 6. 16 Substructures in Elizabeth. Awarded 7-5-50 to Grow Construction Co., Inc., N.Y.C.; $1,092,406.
18,300 cu.yd. open found. exca.
51,500 lin.ft. cast-in-place concrete bearing piles
16,950 cu.yd. concrete in pile caps, footings, bents, abutments, wing walls, parapets
1,750,000 lbs. rein. steel
8,300 lin.ft. storm drains, var.sz.

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No. 31B, Sec. 6. Grade, drain. Awarded 7-5-50 to Grow Construction Co., Inc.; $1,262,875.
2,000 cu.yd. roadway exca. earth
386,000 cu.yd. borrow exca.
30,000 sq.yd. topsoiling
17,500 lin.ft. storm drains & sewers, var. sz.
1,500 lin.ft. water mains, var.
66 ea. manholes
51 ea. inlets
8,900 cu.ft. concrete cribbing
Lump Sum demolition of buildings

•

No. 32, Sec. 6. 4 substructures at Elizabeth Interchange & Bayway. Awarded 7-12-50 to Napp-Grocco Co., Newark, N.J.; $772,803.
10,400 cu.yd. open foundation exca.
24,000 lin.ft. furnishing & driving steel bearing piles
12,000 lin.ft. pile coating
8,100 cu.yd. concrete in foundations, pile tops, footings, abutments, wingwalls, bents, etc.
700,000 lbs. rein. steel
Lump Sum protection of railroad traffic

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No. 33, Sec. 2. 9 Structures. Awarded 6-21-50 to Francis A. Canuso & Son, Philadelphia, Pa.; $1,747,260.
54,000 cu.yd. excavation & grading
11,000 cu.yd. concrete
1,420,000 lbs. rein. steel
3,500,000 lbs. structural steel
40,000 lin.ft. concrete piles
2,900 lin.ft. bridge railing
53,500 sq.yd. pavement
112,000 sq.yd. topsoiling
8,500 lin.ft. pipe conduit

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No. 34, Sec. 5. Raritan Riv. Bridge Superstructure, 18 structures & Route 35 Interchange Grading. Awarded 6-7-50 to John Rosenblum, Inc., N.Y.C.; $2,822,636.
340,000 cu.yd. earth exca.
120,000 cu.yd. borrow exca.
18,000 cu.yd. open foundation
20,000 cu.yd. concrete in bridge structures
6,700,000 lbs. structural steel
30,000 lin.ft. steel bearing piles
2,700,000 lbs. rein. steel
40,000 sq.yd. misc. paving—concrete & bitum.
326,000 sq.yd. topsoiling
13,000 lin.ft. drain pipe var. types & sz.
1,200 cu.ft. granite masonry

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No. 35, Sec. 7. Belleville Turnpike Bridge & D. L. & W. Railroad Bridge. Awarded 6-21-50 to Koppers Co., Inc., Metal Products Div., Baltimore, Md.; $870,825.
3,300 cu.yd. foundation exca.
4,300 cu.yd. concrete
472,000 lb. reinfor. steel
37,800 lin.ft. steel piles
2,260,000 lbs. structural steel
88,000 lbs. wrought iron blast plates
960 lin.ft. metal railing
1,400 cu.yd. porous fill

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No. 36, Sec. 3. 14 Structures. Awarded 6-15-50 to George M. Brewster & Son; $1,763,277.
231,575 cu.yd. roadway exca., earth
232,825 cu.yd. borrow exca.
9,489 cu.yd. open foundation exca. wet & dry
58,360 sq.yd. 4" topsoiling
23,058 lin.ft. cast-in-place concrete piles
11,431 cu.yd. concrete, var.
1,178,800 lb. rein. steel
2,964,000 lb. structural steel
4,124 lin.ft. storm drain, var. types & sz.
20,510 lin.ft. guard rail
42,185 sq.yd. macadam base course, 5" & 8"
33,105 sq.yd. 3" modified penetration macadam intermediate course
42,065 sq.yd. 2" bituminous concrete surface course, hot mixed, type FA-BC-1
61,274 sq. yd. 6"gravel surface
36,145 sq.yd. bituminous surface treatment

No. 37, Sec. 3. 11 Structures. Awarded 7-5-50 to Conduit & Foundation Corp., Phila., Pa.; $2,129,445.
206,720 cu.yd. road exca., earth
77,670 cu.yd. borrow exca.
15,204 cu.yd. open foundation exca. wet & dry
36,250 sq.yd. 4" topsoiling
11,774 lin.ft. untreated timber bearing piles
43,133 lin.ft. cast-in-place concrete piles
19,091 cu.yd. concrete, various
1,805,110 lb. rein. steel
3,961,500 lb. structural steel
1,606 lin.ft. storm drain, var. types & sz.
1,170 lin.ft. guard rail
8,750 sq.yd. macadam base course, 5"
8,750 sq.yd. 3" modified penetration macadam intermediate course
8,870 sq.yd. 2" bituminous concrete surface course, hot mixed, type FA-BC-1
10,230 sq.yd. 6" gravel surface course
7,380 sq.yd. bituminous surface treatment

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No. 38, Sec. 5. 14 Structures & Rahway Riv. Bridge Superstructure. Awarded 7-19-50 to Braun & Stuart Co., Phila., Pa.; $4,648,393.
250,000 cu.yd. earth exca.
24,000 cu.yd. borrow exca.
19,000 cu.yd. open found. exca.
26,000 cu.yd. concrete in bridge structures
10,200,000 lb. str. carbon steel
495,000 lb. str. silicon steel
43,000 lin.ft. steel or concrete bearing piles
2,000,000 lb. rein. steel
36,000 sq.yd. misc. paving, concrete & bitum.
69,000 sq.yd. topsoiling
17,500 lin.ft. drain pipe, var. types & sz.

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No. 39, Sec. 6. 2 Substructures, C. R.R. Viaduct & Humboldt Av. Bridge. Awarded 7-12-50 to Koppers Co., Inc., Metal Products Division; $517,955.
Lump Sum clearing & grubbing
15,000 cu.yd. roadway exca.
200 lin.ft. sanitary sewer—relocated
7,500 cu.yd. foundation exca.
3,500 lin.ft. furnishing & driving steel bearing piles
7,000 cu.yd. concrete in pile caps, footings, bents, abutments, wing walls, parapets
910,000 lb. rein. steel
Lump Sum protection of railroad traffic

No. 40, Sec. 1. 3 Structures & Deepwater Interchange grading. Awarded 7-19-50 to Constructure Service Co., Bound Brook, N.J.; $1,080,918.
130,000 cu.yd. exca. & grading
70,000 sq.yd. topsoiling
Lump Sum removal of existing bridge
8,800 sq.yd. base courses and pavement
4,000 cu.yd. concrete
545,000 lb. reinforcement steel
1,200 lin.ft. rein. concrete pipe, var. sz.
2,000,000 lb. structural steel
20,000 lin.ft. concrete piles
1,800 lin.ft. treated timber piles

•

No. 41, Sec. 4. 4 Structures. Awarded 7-19-50 to Construction Service Co., Bound Brook, N.J.; $1,080,918.
40,000 cu.yd. roadway exca.
1,500 cu.yd. porous fill
11,850 cu.yd. concrete
866,000 lb. rein. steel
2,110,000 lb. structural steel
3,330 lin.ft. con. bearing piles
1,000 lin.ft. bridge drains
3,300 lin.ft. track laying
14,000 lin.ft. track raising
1,750 lin.ft. removing tracks
4,600 cu.yd. ballast

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No. 53, Sec. 2. 9 Structures. Awarded 7-21-50 to Francis A. Canuso & Son, Phila., Pa.; $1,470,118.
27,000 cu.yd. exca. & grading
10,000 cu.yd. concrete in bridge structures
1,206,000 lb. rein. steel
3,115,000 lb. structural steel
39,000 lin.ft. concrete piles
14,000 lin.ft. timber piles
2,800 lin.ft. metal bridge railing
2,500 sq.yd. pavement
17,000 sq.yd. topsoiling
2,500 lin.ft. pipe conduit

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No. 54, Sec. 7. Erie RR—County Road Viaduct. Awarded 7-12-50 to Peerless Construction Co., N.Y., N.Y.; $1,896,936.
9,700 cu.yd. open foundation excavation
620 cu.yd. porous fill
12,700 cu.yd. concrete
1,475,000 lb. rein. steel
5,180 lin.ft. steel piles
7,100,000 lb. structural steel
2,725 lin.ft. metal railing

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No. 58, Sec. 5. Grade & Top soil. Awarded 7-5-50 to R. J. Groves & Sons Co.; $491,850.
75,500 cu.yd. road exca. muck
269,500 cu.yd. borrow exca. & embankment
2,500 cu.yd. channel exca.
45,500 sq.yd. topsoiling

(*Continued from page 47*)

again sent representatives into the various fields and heard all requests. This in no small way held the engineers up in the completions of their designs.

5.—The requests of the citizens and local officials for expensive viaducts in lieu of earth embankments with bridges at cross streets became excessive and caused innumerable delays in the design and the drawing of specifications in order to award contracts for the construction of the turnpike.

6.—Another problem which caused considerable delay in the negotiations was the opposition of pressure groups to influence the relocations of the turnpike to avoid tracts of land which they might develop at some future date.

7.—The negotiations relative to clearance of glide paths at airports, especially at the Newark Airport, created delay, because the Authority not only had to consider the safety factor in conjunction with these glide paths; but the railroad clearances and the New Jersey State Highway routes and intersections as well.

After clearing the glide path, the grade line goes up over railroad tracks and under the west approach to the Pulaski Skyway. It then starts down over industrial areas, state highways, and railroad tracks, bending a little to the east to avoid the Public Service power plant and thence over the Passaic River. This is over a highly industrialized area.

8.—Another of the man-made problems was that of finding a location for the turnpike through the city of Elizabeth, N. J. After studying several routes, the location finally determined required the demolition of 300 houses. It was the least expensive yet one that caused considerable opposition.

Turnpike Leaders

Acknowledgements — Without the wholehearted cooperation of Commander Charles M. Noble, Chief Engineer, New Jersey Turnpike Authority, this story would not have been possible. The writer wishes to thank the following also for their necessary assistance. Henry E. Rose, Director, Department of Public Information; Col. W. J. Delaney, Assistant to the Chief Engineer; George W. Mulheron, Engineer of Agreements.

Personnel of Authority — Honorable Paul L. Troast, Chairman; Honorable George F. Smith, Vice-Chairman; Honorable Maxwell Lester, Jr., Secretary-Treasurer; General W. W. Wanamaker, Executive Director.

Over 1700 Machines! Some of the Equipment Massed on the New Jersey Turnpike

The 1700 units tallied here were those reported on 29 contracts totaling over $75 million in value, as of August 11, 1950. This list may include some duplication by contractors having more than one section, but such duplications are believed to be minor. The lists represent the early phase of most of the contracts and do not include many items which may be added later. No paving equipment is included since paving contracts for 1951 construction were not to be awarded until October or later.

(Section 1) Contract 3; S. J. Groves & Sons Co.

22 heavy tractors
1 medium tractor
1 light tractor
21 power control units
2 heavy tilldozers
1 rubber-tired bulldozer
9 heavy bulldozers
1 front-end-loader-type dozer
9 power shovels (1 to 2½-yd.)
6 self-propelled scrapers
10 light plants (1500-watt)
3 electric welders (200-amp.)
2 clearing rakes
7 dragline buckets (¾ to 3 yd.)
2 rehandling buckets (1¾-yd.)
2 clamshell buckets (¾ and ¾ yd.)
8 tractor-drawn scrapers
1 super compactor (100-ton)
1 super-compactor (50-ton)
2 rollers, 10-ton 3-wheel
4 sheepsfoot rollers, dual drum
1 pneumatic roller, 13-wh. wobble
2 heavy motor graders
3 electric generators
2 vibrator units
2 lubrication outfits
2 compressors (105 and 315)
6 air tampers
7 pumps (2" to 6")
11 trucks, pick-up
3 trucks, panel
4 trucks, flat bed
3 truck tractors (50-ton)
3 machinery trailers
3 automobiles

(Section 2) Contracts 7 and 27; Savin Construction Company

4 sedan automobiles
10 pickup trucks
1 tractor and trailer
2 welding trucks
1 gasoline truck
2 grease trucks
1 stake rack truck
2 dump trucks
8 tractors
13 bulldozers
9 bottom dump wagons (12-yd.)
7 bottom dump wagons (28-yd.)
3 bottom dump wagons (15-yd.)
7 cranes
3 shovels
2 power belt loaders
10 tractor drawn scrapers (15 to 30 yd.)
4 graders (motor)
3 stump wagons, 30-yd.
2 air compressors
1 well drill
6 self-propelled scrapers
4 gasoline saws
3 water pumps (4-in.)
3 rubber tired rollers
4 sheepsfoot rollers
1 cement bucket
1 light plant
3 complete sets of leads, hammer and mandrel for driving sand drains

(Section 2) Contracts 33 and 53; Francis N. Conuso & Son

2 air compressors (500-cfm.)
1 crane with clamshell
1 truck-mounted crane
1 complete set of equipment for making soil load tests

(Section 3) Contract 8; George M. Brewster & Sons, Inc.

3 heavy-duty power belt loaders
1 power shovel (⅞-yd.)
1 power crane (3-yd. dragline)
8 self-propelled scrapers
23 heavy tractors (17 with dozers)
7 motor graders
51 bottom-dump wagons
12 sheepsfoot roller sets
1 air compressor (500-cfm.)
1 super compactor (100-ton)
2 water wagons (3500-gal.)
1 tractor trailer (40-ton)
2 grease trucks
1 centrifugal pump (3-in.)
2 tire trucks (1-ton)
4 pickups
4 Jeeps
2 sub-trucks
2 welders (500-amp.)
2 fuel trucks
1 mobile shop
1 flat bed truck
1 truck (1½-ton)

Holmes & English, Clearing & Grubbing (Subcontract)

1 backhoe
1 heavy tractor with dozer
2 trucks (½-ton)
1 compressor (500-cfm.)

Costono & Manning, Pipe Drainage (Subcontract)

1 power shovel (⅝-yd.)
1 heavy tractor
1 winch truck
1 truck (½-ton)

(Section 3) Contract 28; Union Building & Construction Corp.

1 truck crane ¾-yd.
1 light tractor with dozer
1 crane, steam pile driving hammer
1 boiler (75 hp.)
1 pump (3" jet)
1 compressor (500)

(Section 3) Contract 36; George M. Brewster & Sons, Inc.

1 power crane (3-yd. dragline)
3 self-propelled scrapers
2 heavy tractors with dozers
1 motor grader

(Section 4) Contract 9; Grandview Construction Company

6 super rollers (100 ton)
3 motor graders
6 dump trucks (5-ton)
33 bottom-dump wagons
2 heavy power belt loaders
28 tractor-drawn scrapers
28 heavy tractors, some with dozers
10 medium tractors with dozers
4 light tractors with dozers
5 excavators, various capacity, with crane, shovel dragline and clamshell equipment
2 compressors (500-cfm.)
5 Jeeps
14 trucks (2½-ton)
7 trailers, machinery

(Section 4) Contract 21; P. T. Cox Construction Co., Inc.

1 crawler crane (1-yd.)
1 truck crane with pull-shovel
1 tractor-crane, with pile leads
1 compressor (315-cfm.)
2 clamshell buckets (¾-yd.)
1 pile hammer
2 sheeting hammers
3 concrete buckets
4 concrete vibrators
1 table saw
2 diaphragm pumps (3-in.)
1 centrifugal pump (1½-in.)
2 pneumatic clay spades
1 acetylene burning and welding outfit
1 gasoline boring machine
1 pick-up truck
1 rack truck (7-ton)
1 rack truck (5-ton)

(Section 4) Contract 23-29; Brookfield Construction Company

1 power crane (¾-yd.)
1 heavy tractor with dozer

(Section 5) Contract 4; Spearin, Preston & Burrows

1 derrick barge 40'x100' (15 ton)
1 pile hammer (5-ton)
3 centrifugal pumps (4" and 6")
1 sheeting extractor
1 compressor, steam operated (500-cfm.)
2 winches, 3-ft. drum
1 floating concrete plant, 50'x 175' barge, with 1 gas crane 80' boom, one 1-yd. mixer, one 3-batch hopper for concrete aggregate, 1 1000-gal. water tank with gauges, 1 weighing scales, one ¾ yd. clamshell bucket, one 1-yd. tremmie concrete bucket, one 1 yd. concrete bucket
1 carpenter shop barge with gas-driven saw
1 compressor (200-cfm.)
1 clamshell bucket (¾-yd.)
1 tugboat, 100-hp. diesel
2 centrifugal pumps, 2" gas operated
2 concrete vibrators, gas driven
1 cement storage barge—house type
3 materials barges (40'x80')
1 floating dock (5'x7' Navy cubes)
1 water barge (5'x7' Navy cubes)

(Section 5) Contract 10; Villa Contracting Company

4 crawler cranes
3 truck cranes
2 backhoes
17 bottom-dump wagons
23 heavy tractors, some with dozers
2 rubber-tired dozers
8 tractor drawn scrapers
15 self-propelled scrapers
1 industrial tractor
5 sheepsfoot roller units
5 pneumatic rollers
1 water truck (1,000-gal.)
1 water truck (2,000-gal.)

4 motor graders
2 service trucks
2 maintenance trucks
2 Jeeps
5 Weapon Carriers
1 utility truck
4 pickups
1 automobile
1 flat truck
3 engineers' trucks
1 water tank trailer
2 water tank trailers (175-gal.)
1 air compressor (250-cfm.)
2 sheeting drivers
1 chain saw
2 power saws (tree)
1 electric generator
2 gas-driven generators
1 gasoline-driven vibrator
1 electric welding machine (500-amp.)
2 concrete buckets
5 concrete hoppers
25 elephant trunk concrete chutes
1 wrecking ball
2 water pumps
2 diaphragm pumps (3")
5 water pumps (2", 3", 4")
1 curing spray machine
1 speed pump (3")

(Section 5) Contract 12; Linds-Griffith Construction Co.

2 floating derricks (20-ton)
1 steam crane (1½-yd.)
1 truck crane (20-ton)
1 compressor (315-cfm.)
2 centrifugal pumps (6")
1 double diaphragm pump (4")
3 pile hammers
1 flat scow
1 truck (5-yd.)
1 carfloat (250'x37')
2 centrifugal pumps (3")
1 mud pump
6 clay spades
3 clamshell buckets (¾-yd. to 1¼-yd.)
1 tremmie concrete bucket
1 concrete bucket
1 concrete hopper
12 3' sections elephant trunk
1 dipper stick dredge (5-yd.)
1 goose-neck derrick (25-ton)
2 flat scows
1 tug
1 welding machine (500-amp.)

(Section 5) Contract 34; John Roseblum, Inc.

2 heavy tractors
1 rubber-tired dozer
1 sheepsfoot roller unit
3 self-propelled scrapers
1 power shovel (2-yd.) with backhoe

(Section 5) Contract 38; Brans & Stewart

2 tractor drawn scrapers
1 heavy tractor with dozer
1 motor grader

(Section 5) Contract 58; S. J. Groves & Sons Company

1 backhoe (¾-yd.)
1 power shovel (2½-yd.)
1 power shovel (1½-yd.)
1 dragline (2-yd.)
3 heavy tractors
1 medium tractor
1 light-crawler tractor
1 front-end loader
1 motor grader
1 sheepsfoot roller set
1 steel roller, 3-wh. diesel
30 dump trucks (5-ton)

(Section 6, Bridges) Contract 5; The Underpinning and Foundation Co.

1 air receiver (42"x12')
1 bar bender
3 blasting mats; 10'x12' wire rope
2 blasting mats, rope
1 row boat, outboard motor
1 launch
3 boring machines
1 clamshell bucket (¾-yd.)
5 burning outfits, gauge and hose
7 saws, air powered
6 chain falls (10-ton)
1 air compressor (350-cfm.)
2 air compressors (500-cfm.)
1 truck crane
1 tractor crane
1 steam generator
4 pile hammers
1 concave driving head
1 pontoon (24-in.)
13 pontoons (20-in.)
2 pumps (1½" & 2")
1 plunger pump (3-in.)
1 sump pump
1 scow
1 power shovel
1 pick-up truck
1 voltage regulator
1 blasting machine
1 blasting magneto
2 clay diggers
2 galvanometers
7 jackhammers
4 rock breakers
5 pavement breakers

(Section 6, Bridges) Contract 14; George M. Brewster & Son, Inc.

9 power cranes (various sizes to 3-yd.)
1 truck crane (¾-yd.)
2 pile driving leads (70' and 100')
6 pile hammers
1 pile extractor
10 compressors (500's)
1 heavy tractor with dozer
1 light tractor with dozer
1 motor grader
18 centrifugal pumps (2" and 3")
2 concrete buckets (1½-yd.)
4 clamshell buckets
2 band saws
1 table saw
2 air receivers (8x10)
6 pick-up trucks
1 suburban auto
1 lubrication truck complete
1 fuel truck (1,000-gal.)
1 flat truck
3 gasoline power saws
2 34-E pavers
5 concrete vibrators

(Section 6, Bridges) Contract 15; Del Balso Construction Company

2 truck cranes (½-yd. bucket)
1 compressor (315-cfm.)
1 compressor (500-cfm.)
1 air sec. tank 500 ft.
1 pile extractor
2 heavy tractors, bulldozers
1 suction pump (2-in.)
1 pump (4-in.)
1 crane (2-yd.), 1-yd. bkt. & frame for pile driving
1 set pile leads (65-ft.)
1 motor grader
24 trucks (2 to 8-yd.)

(Section 6-7) Contract 1; Poirier & McLane

2 pick-up trucks
1 Jeep
1 grease trucks (2-ton)
5 dump trucks (4-yd.)
2 compressors (500-cfm.)
1 compressor (215-cfm.)
1 sand drain rig
2 tool wagons
5 heavy tractors
6 tractor-drawn scrapers (12½-yd.)
1 wobble wheel roller
6 crawler cranes
2 pneumatic rollers
4 front-end loaders
2 hydraulic dredges
1 generator, gas driven
4 diaphragm pumps (6", 4" and 2")
3 centrifugal pumps (3-in.)
3 paving breakers
2 chain saws (24-in.)
2 generators (5-kw.)
1 welder (500-amp.)
1 steam rig for sheet piling
1 flat truck (2½-ton)

(Section 6-7) Contract 2; George M. Brewster & Son, Inc.

2 pickups
1 grease truck
20 dump trucks (12-yd.)
1 power shovel (2½-yd.)
3 heavy tractors with dozers
1 roller (100 tons)
1 roller, rubber-tired
2 rollers, sheepsfoot

(Section 6-7) Contract 11; George M. Brewster & Son, Inc.

60 heavy dump trucks
10 pickups
2 maintenance trucks
1 flat truck
1 field truck
6 light plants
1 welding machine
1 water wagon
3 excavators (2½-yd.)
2 excavators (2-yd.)
4 cranes (3-yd.)
6 heavy tractors
14 end dump wagons
7 compressors (500-cfm.)
12 wagon drills

(Section 6-7) Contract 13; The Napp-Grecco Company

4 heavy tractors
1 light tractor
1 power crane (½-yd.)
1 power shovel (1¾-yd.)
1 power crane
1 power crane (3¼-yd.)
2 pneumatic rollers
2 sheepsfoot roller sets
1 farm tractor
1 steel roller, 10-ton 3-wh.
1 tractor-mounted crane
1 diaphragm pump (3-in.)
2 centrifugal pumps
1 dock winch
1 motor grader
1 pickup truck
1 maintenance truck
45 dump trucks 7 and 7½-yd.

(Section 6-7) Contract 18; George M. Brewster & Son, Inc.

27 heavy dump trucks
12 pick-up trucks
4 maintenance trucks
2 grease trucks
2 flat trucks
2 field trucks
3 truck tractors, heavy
11 light plants
3 welding machines
3 water wagons
80 dump trucks (12-yd.)
3 backhoes
1 excavator (2½-yd.)
1 excavator (2-yd.)
2 truck cranes
6 large crawler cranes
12 bulldozers
2 end-dump wagons
3 front end loaders
9 compressors (500-cfm.)

(Section 6-7) Contract 28; Union Building and Construction Co.

2 crawler cranes (3-yd. drag)
1 crawler crane (¾-yd. drag)
5 heavy tractors, some with dozers
1 tractor-drawn scraper (25-yd.)
1 sprinkler truck (3,000-gal.)
1 grease rig
1 spray rig, chemical dust odorizer (1,000-gal.)
2 compressors (600-cfm.)
1 rack truck (5-ton)
30 heavy dump trucks (10 to 12 yd.)

(Section 7) Contract 6; R. B. Jaggard Engineering Company

3 power cranes (up to 3-yd.)
1 concrete mixer (2-yd.)
1 batch plant
3 steel scows
2 wooden scows
2 steam boilers
2 compressors (500 and 250)
1 electric welder (500-amp.)
2 generator plants
4 pumps (2", 3", 6")
1 power boat
1 row boat, large
1 power hand saw
2 dump trucks, heavy
3 pick-up trucks
2 pile hammers
1 stake truck (2½-ton)

(Section 7) Contract 16; Cayuga Foundation Corporation

2 crawler cranes (50-ton)
1 pile driver, 80-ft. leads
2 crawler cranes (20-tons, steam)
1 truck crane
1 pile hammer
1 medium tractor with dozer
2 dump trucks
2 compressors (500)
2 concrete buckets (1-yd.)
10 pumps (2" to 4")

EDITORIAL

★ How's Your Equipment Inventory?

Lucky is the contractor who has all the equipment he thinks he'll be needing for a while, or else has plenty of cash to lay on the barrel head and a good equipment connection that will give him the inside track on needed items.

Many manufacturers and dealers are sold out for months ahead, due to the general construction boom and the buying impetus set off by the Korean situation. The federal government is now in the market for large quantities of equipment for military and civilian use, further adding to the demand.

Contractors are being advised to take stock and get their orders in for next year as soon as possible. Even at this late date, better late than never, and better to guess on what jobs will be landed in 1951 and be equipped, than to wait until then and be out of luck completely.

★ Thoughts on the Pennsylvania Turnpike Opening

Sometime this month the $86,000,000 Philadelphia extension of the Pennsylvania Turnpike was scheduled to be thrown open to traffic along its 100 miles of line. This event, while lacking the spectacular news value of the original Turnpike's opening a decade ago, nevertheless is an occasion for some reflection.

Firstly, the extension's opening to traffic suggests that one review arterial highway design for a moment. In some respects this is a mature art; we see in the similarity of design standards between the original turnpike and the present extensions, evidence that road design has grown up. Geometric standards are little advanced from the bold, advanced design adopted in 1938. The principal change is in drainage, subgrade, joints and other pavement details, reflecting the need for greater strength and durability to support today's heavy truck traffic. The very heavy pavement and extreme densification of subgrade recommended for the neighboring New Jersey Turnpike makes one wonder if, indeed, the Pennsylvania Turnpike's pavement design is heavy enough—in fact, aren't we designing thousands of miles of arterial roadbeds with a factor of safety against structural deterioration and failure smaller than that dictated by sound engineering principles? How would a banker have you design *your* roads?

Secondly, the Extension's completion in three years from the start of preliminary design serves to spotlight the strides have been achieved in streamlining engineering procedures. Aerial location, stereo mapping, geophysical sub-surface exploration, short-cuts in the design room—all contributed to major saving in time and engineering cost.

Thirdly, let us not forget the role of the contractors and their equipment fleets. The capacity of highway builders to produce was again demonstrated here. This capacity will stand our nation in good stead in the uncertain international situation ahead.

And lastly, this event spotlights the fact that we are in an era of toll road construction representing some five hundred million dollars. The people in the Northeastern part of the United States like the turnpike idea. It shortens their wait for better highways by ten, twenty, who knows how many years. And hard-headed private underwriters assure that the projects are planned well and will pay off—something that cannot be said of many a road project in general.

Yes, whether we like it or don't, the toll turnpike is here for special highway needs. For this we can thank the petroleum and trucking industry and other interests who have so successfully fought efforts to raise new tax revenues for state-wide road programs. In a sense, they gave the toll road its biggest impetus.

★ What Highway Transportation Means to National Defense

The following is from "The Highway Transportation Story—In Facts," published by the National Highway Users Conference to better inform the public on the giant role played by highway transportation in their lives and the nation's life.

Highway transportation makes every community, regardless of size or accessibility, a potential arsenal of supply for our forces of national defense. The mobility of manpower, supplies and weapons of defense, afforded by highway transportation, is of indispensable military importance.

During World War II, the automotive industry supplied war products valued at $28,970,000,000 for the armed forces. Included in this total were almost 3,500,000 vehicles such as trucks, jeeps, trailers, tanks, self-propelled artillery, etc.; 21,835 airplanes, 4,288 gliders and 5,830,980 guns of all types.

The rubber and petroleum industries performed miracles in producing synthetic rubber and high octane aviation gasoline in then unheard of quantities. Without them the war could not have been prosecuted as it was.

Thousands of trucks, often with sealed cargoes, rushed vital munitions direct to dockside from factory during the last war, saving vital time and thus saving lives.

During the war, 35 million gasoline ration cards were issued, testifying to the nation's dependence on the motor vehicle in the successful pros-

★ Speaking the Sentiments of Us All

To the Members, American Road Builders' Association:

Half a billion dollars a year in Federal aid for Primary, Secondary and Urban highways has been authorized by Congress for 1952 and 1953. This is an increase of $50 million annually over the allocations for the current biennium. Measured against road and street needs, the increase is not large. Nor will the amounts authorized, even when matched by State funds, provide the capital we should be investing to meet today's unprecedented traffic needs.

Yet, the very fact that Federal aid is to be increased in these days of war-necessitated economies should be a source of satisfaction to all of us in the highway industry and profession. The recognition given to the essentiality of highways by this step, taken in the face of rapidly-changing world conditions and the stepped-up tempo of our defense and war preparations, should prove to be extremely valuable to us as advocates of an adequate highway program in the years to come when emergency conditions no longer prevail.

The ARBA position in pointing up the inadequacies of America's present highway system—especially those resulting from the deterioration which took place during World War II when highway construction was virtually at a standstill—has been strengthened. So has that of the American Association of State Highway Officials. It will be recalled that in testimony presented upon invitation by Congressional committees, the ARBA advocated a billion dollars a year in Federal aid and the AASHO recommended $810 million annually, while other testimony ranged all the way down to that of opponents to any Federal aid at all.

Recommendations made by the House and Senate committees weighing this evidence were that regular Federal aid should be, respectively, $570 million and $620 million, both substantially in excess of the $450 million provided in the current biennium. In fact, the House adopted legislation calling for $570 million a year in regular Federal aid. It was only after the outbreak of the Korean hostilities and the change in world conditions that reductions were made in these authorizations. There is no doubt that, had the country not been forced into an accelerated program of preparation for war at the very time highway legislation was under consideration, the patent need for greater highway appropriations would have been recognized by even more substantial increases.

As it is, the job we now face in the highway industry, in these days of war-imposed domestic economies, is to make every dollar count in fulfilling our objective: the building of more and better roads as economically as possible. I am certain that, as always, the industry will measure up to the country's expectations and provide the best network of traffic arteries possible with the funds available.

With all good wishes for the successful prosecution of the program ahead, I am

Cordially yours,
E. Reybold,
Executive Vice President.

ecution of the war on the "home front."

During World War II, the Army alone had 1,600,000 wheeled automotive vehicles at peak strength. In ddition tens of thousands of other self-propelled vehicles, such as tanks and other track-laying units, were used. (The number now required for peacetime preparedness is classified information.)

All of the industries serving highway transportation were integral parts of the war effort in 1941-1945, but their timely contributions were made possible only by their peacetime volume.

The military developments in wheeled vehicles have been revolutionary. The trucks and trailers now in use range up to a rated 100 tons, hitherto unheard of except on track-laying vehicles.

Highway transportation will form the backbone of all means of evacuation from threatened areas in the home sector, and in this particular the private automobile will be called upon to bear the heaviest load. Completely unorganized as this form of transport may be, it nonetheless provides the most effective method of mass evacuation. It is also susceptible of organized military use in continental operations.

A highway system adequate to serve peacetime needs is regarded by military authorities as essential to meet wartime demands.

★ Truck Overloading in National Spotlight

This country's need for speeding up road building has come in for a great deal of big time publicity lately. The September issue of Harpers carries a story entitled "Our Roads Are Going to Pot." In it the author spotlighted the wide-spread disrepair and obsolescence of roads in selected areas, such as North Carolina, and discusses the role of heavy trucking. The September 16 issue of the Saturday Evening Post contained a much discussed article entitled "Are Trucks Destroying Our Highways?"

Both articles hit the problem right on the button by focusing on the wholesale overloading of the trucks. In one sense it seems too bad that such powerful articles should wait to appear now, at a time when we are faced with curtailment rather than expansion of road building, and with possibly another period of stepped-up military and defense hauling and a relaxation of load limits.

Or perhaps these articles were ideally timed, after all. If we are entering a mobilization and war industry period remotely like that of 1941-1945, it won't take long for huge mileages of roads to get literally beyond repair from the "one-two" punch of increased trucking and postponed repairs or renewal. Those who realize the importance of a strong highway system in time of war are performing a service to give all possible publicity to highway needs.

IT COSTS LESS TO BUILD GOOD ROADS THAN TO HAVE POOR ROADS

They Scalped a Mountainside

★ Air view of the West End By-pass project, showing spectacular hillside location and deep side-hill cuts involved. Roadway shelf just beginning to be formed *Pittsburgh Press Photo*

. . . to Build New Pittsburgh Expressway Link

Spectacular shelf roadway entailed unusual problems of location, design and construction control by Pennsylvania highway department. Harrison Construction Co. employed nine shovels to move 1,250,000 cu. yd. excavation in 1.08 miles of line

ONE of the most audacious highway locations in American road-building annals is that adopted for the new West End By-Pass to South Hills, in Pittsburgh, Pa. Situated along a steep valley just across the river from downtown Pittsburgh, this short stretch of road will connect with the much-publicized Penn-Lincoln Parkway, Pittsburgh's $60 million East-West expressway now under construction.

The West End project when completed will take traffic along a 4-lane-divided concrete roadway, located on a mountainside shelf some 10 to 30 ft. above an existing railroad line in the valley.

The steepness of the natural slopes made it necessary to literally slice away the entire hillside for much of the distance. Cuts extend as high as 190 ft., and an estimated 1,250,000 cu. yd. of material, virtually all spoil, will be excavated to complete the job.

Despite the steepness of the terrain, a road along this hillside had many logical reasons in its favor and the site was seriously considered before the War. Top engineers in the Pennsylvania highway department in 1940 made a tentative centerline location following core borings and other field studies. From these and more recent data a roadway design was developed which provides for two 24-ft. concrete roadways with 4 ft. separation strip. The roadway grade is 72 ft. wide.

The 5700 ft. project includes three huge unbroken cut areas respectively 2100 ft., 2100 ft. and 800 ft. long, separated by natural gullies. The roadway will be carried across one gully on a fill, and a street underpass will be built at the other.

Because of the project's unusual nature, extensive core borings were taken for purposes of design. These borings, using 4-in. diameter casing and 2½-in. diamond drill or steel bit were made at intervals of about 300 ft. along the centerline. And in addition test holes were drilled along the cross-section, working well above the roadway level. All borings for classifi-

cation of material in cuts were carried to grade depth. Those for determining foundations for structures were carried 10 ft. into good rock. This involved going down 80 to 90 ft. in some instances. Pennsylvania Drilling Co., of Pittsburgh, Pa., performed this work under a separate contract. The casing was driven 3 ft. and then pulled, the soil classified and a sample placed in a glass jar. All rock cores were retained and boxed together with the soil samples. These were stored at the Pennsylvania Highway Department Garage at Aspinwall, where they were available for inspection by contractors bidding the job.

From cores and disturbed samples the hillside was found to be made up of practically flat lying blue shale and sandstone belonging geologically to the Pennsylvanian system. Much of the material encountered consisted of fine cemented clays which required blasting but disintegrated rapidly on exposure.

Slope Angle Adjusted

Design slopes shown on the plans were considered by the engineers to be quite tentative. The slopes initially adopted ranged from 1½:1 to 2:1 for the first reaches above the roadway. A 16-ft. wide bench with drain ditch was established at varying heights above the road as a protection against falling rocks and as a means of stability. Slopes above this bench were made as steep as the terrain would permit, usually 1:1. Slopes of rock fills below the roadway vary from ¼:1 to ⅝:1.

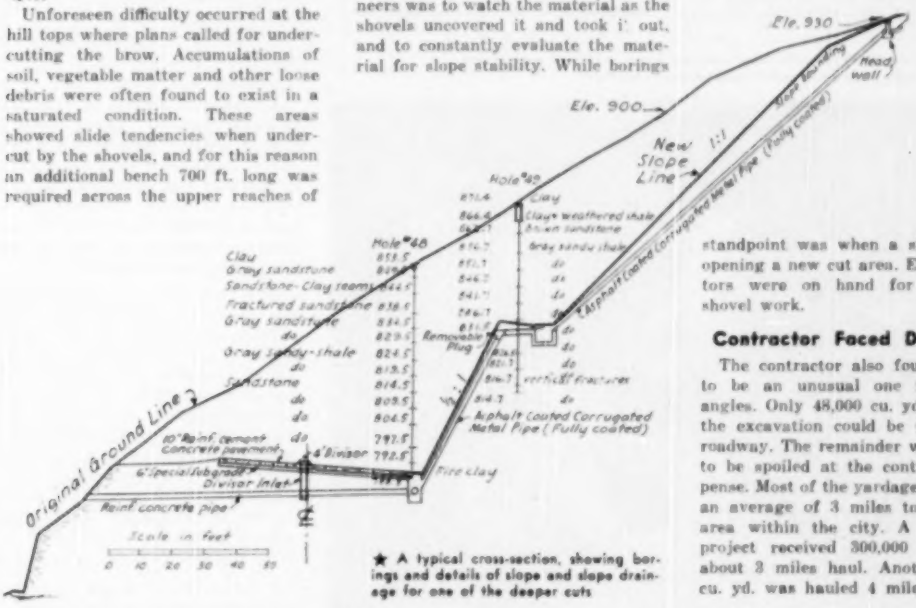
Unforeseen difficulty occurred at the hill tops where plans called for undercutting the brow. Accumulations of soil, vegetable matter and other loose debris were often found to exist in a saturated condition. These areas showed slide tendencies when undercut by the shovels, and for this reason an additional bench 700 ft. long was required across the upper reaches of one of the largest cuts. Several slides took place; whenever a slide occurred the engineers went up with a core rig, located a new rock ledge and designed a new bench to fit the conditions. A 1300-ft. section of a hill-top street required relocating due to undercutting.

★ Over half the material required drilling and shooting. This scene near the river end of the project

Extra benches, slide removal, and field changes in cut slopes have added approximately 150,000 cu. yd. to the excavation originally estimated at 1,100,000 cu. yd. But except for one slide of 60,000 cu. yd., relatively little trouble from slides has occurred considering the magnitude and character of the project.

Knowing that unusually close contact between field and office would be necessary during the grading the district highway office at Pittsburgh and the testing laboratory personnel from Harrisburg gave the project special attention. The chief role of the engineers was to watch the material as the shovels uncovered it and took it out, and to constantly evaluate the material for slope stability. While borings showed the nature of the material, they didn't fully reveal the extent of faulting and general disintegration encountered as work progressed. Faulting was revealed to be extensive, and not in clean-cut lines, and large areas in the hill disintegrated. In the words of one of the engineers, "we found a lot of rotten stuff." Slopes shown on the plans were frequently revised in the field and the slope lines tentatively adopted were watched for instability. The job, hence, was one of keeping experienced men on the watch and of "cut and try" adoption of slopes, rather than of requiring special laboratory tests. Only routine examination of soils and rocks to determine their classification was made.

In addition to modifying cut angles, minor line changes were also found necessary as the job opened up. The most critical time from the engineer's standpoint was when a shovel began opening a new cut area. Extra inspectors were on hand for night-shift shovel work.

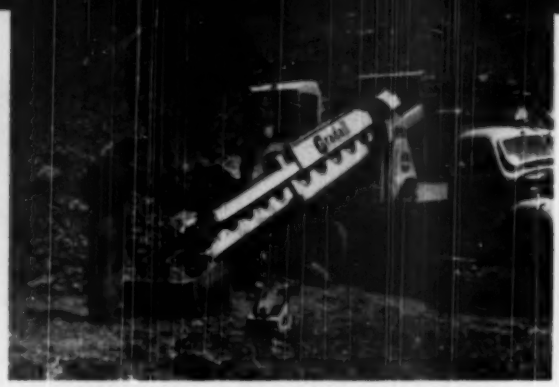


★ A typical cross-section, showing borings and details of slope and slope drainage for one of the deeper cuts

Contractor Faced Difficulties

The contractor also found this job to be an unusual one from many angles. Only 48,000 cu. yd. or 4% of the excavation could be used in the roadway. The remainder was required to be spoiled at the contractor's expense. Most of the yardage was hauled an average of 3 miles to a disposal area within the city. A city street project received 300,000 cu. yd. at about 2 miles haul. Another 300,000 cu. yd. was hauled 4 miles and com-

★ One of the nine shovels, working on a tight ledge. Planning of ramp roads and excavating sequence an important part of the job



★ This machine was used to cut drain trenches and excavate for shallow structure footings

pacted in layers as fill for a section of the Penn Lincoln Parkway.

The engineers made certain that bidders on the project clearly understood the special conditions and contract provisions obtained for design use. Core drill data were made available to bidders. The contractors were asked to set a bid for the big item, that of unclassified excavation, knowing what they were to expect. The principal uncertainty was the possible extra yardage of excavation and waste that might be required in order to carry excavation below plan slopes. The contract clause in question read as follows:

"This Class 1 excavation placed in waste areas will include any and all additional excavation which may result from slides, and no additional or separate compensation shall be paid for this work other than the above noted unit price."

Harrison Construction Co., successful bidder, took the excavation at $1.60 per cu. yd. The percentage of tight rock material proved lower than many anticipated. However, over 50% of the yardage required shooting, and all of it was handled with shovels.

A maximum of nine shovels were put on the job. Two ¾-yd. machines were used as pilot shovels to cut roads to the tops of cuts, and served as backhoes for drain trenches. Major digging was performed with 2 and 2½-yd. shovels. These machines—all Lorains—loaded to a fleet of Euclid bottom-dump and end-dump trucks where material was used on the project or wasted with off-road hauls. A large part of the excavation, however, had to be transported over the Pittsburgh street system. This yardage was handled under a sub-contract with Allegheny Construction Equipment Co. of Pittsburgh, which used a fleet of 23 Autocar trucks. Trucks were equipped with 165-hp. Cummins diesel engines, 10-yd. dump bodies and dual rear axles (10 tires). The excavating plan was to ramp the shovels to the top of the slope and work down by benches at 12 ft. intervals. Horizontal drill rigs were used for some of the initial shooting, to get ramps built and work started. Then a wagon drill was put in behind each shovel as soon as possible.

★ Looking along the project, from vantage point part-way up the highest cut slope. Note berm on far left. Roadway partly graded

Delayed Blasting Required

Blasting was a major item, and one closely controlled due to the proximity of the railroad line and hilltop residential property. Specifications required that not more than 500 lb. of blasting materials could be shot in one charge. Millisecond delayed action caps with seven delays were used, and charges were usually limited to not over 75 lb. per delay, although specifications permitted 100 lb. maximum. While drilling proceeded night and day, blasting was done only in the daytime. Dupont 60% extra dynamite and Atlas 60% Geladyne in 1½x8 in. cartridges were used.

A maximum of five wagon drills (Gardner-Denvers and Ingersoll-Rands) sufficed, working two 10-hour shifts. Timken drill steel of 2-2⅛-2½-in. diameter was used; hard rock bits were not considered necessary. At the peak of operations there were six compressors, including one 500 cfm. unit, three 316's, one 265 and one 105.

So far we haven't mentioned drainage. As expected, seepage was a major problem, and another engineering task requiring use of judgment in the field was to determine the location of rundowns from summits, top-of-cut intercepting trenches, and bench drain ditches. Rundowns lead to inlets which take surface run-off under the roadway. These lines plus roadway underdrainage required the use of over 3500 lin. ft. of bituminous coated corrugated iron pipe of 15 in., 18 in., and 24 in. diameter. An extensive footage

(Continued on page 60)

Ohio's Emergency Bridge Methods

How repairs are set up and some of the methods used. 286 structures received $500,000 in improvements in Ohio last year. 37 required emergency attention due to overload, collision, fire or flood.

By L. F. Schaeublin

Assistant Director and Chief Engineer, Ohio Department of Highways, Columbus.

THE Ohio State Department of Highways maintains 9,700 bridges of over 10 ft. span, and 87,000 smaller structures. Many of these are too narrow for present day traffic. About one-third of the 9,700 are too weak to carry legal loads.

The strengthening or replacement of weak structures is being carried out to the full extent of funds available for that purpose. Many of these structures are being replaced by contract out of Highway Improvement Funds. However, there are numerous structures in such a critical condition that they are a menace to traffic and cannot wait for the necessary planning, availability of funds, contract sale, etc. Structures in this category are being strengthened or replaced with Maintenance Funds by contract and by force account method. 286 structures were widened, strengthened, or replaced in 1949 at a cost of about $510,000. The 1950 program of the Bureau of Maintenance consists of 300 structures, estimated to cost approximately $550,000.

Weak structures, pending replacement or repair, are posted with signs showing the percentage of load reduction. An advance warning sign is placed at the nearest intersecting highway; another warning sign is placed on the approach.

Numerous Collapses

One of the major problems of the Bureau of Maintenance are the structures, good, fair and poor, which are damaged or destroyed by overloads, collision, fire or flood. There were 37 such structure emergencies in 1949. 32 emergencies were caused by collision or overload. Most of these involved a violation of the law, i.e., loads in excess of legal maximum weight or in excess of posted load limits, excessive speed, disregarding warning signs, etc. Four emergencies were caused by floods, and one by fire. The total expenditure for the 37 emergencies was $205,551. These emergencies were handled by Division Maintenance Forces.

The emergency methods, materials, and type of organization used to make emergency repairs to damaged structures, or to replace destroyed structures, are now so well established that these repairs or replacements have become an almost routine operation.

Protection of Traffic

The first consideration in any highway emergency is, of course, the protection of traffic. In the initial stage of the emergency, traffic is directed manually by any available members of the maintenance forces and the State Highway Patrol. If the structure has been destroyed, of if it has been damaged to the extent that it must be closed to traffic, the Division Route Marking Crew is immediately ordered to select and establish the best available detour around the emergency.

Emergency Reporting Procedure

It is the duty of any member of the Department, including the State Highway Patrol, on first learning of an emergency condition, to immediately start the reporting procedure. This procedure follows established channels from the employee at the scene to the Director of Highways via the County Superintendent, Division Maintenance Engineer, Division Engineer and Chief Engineer of Maintenance and Repair. The established communication is via telephone, teletype or State Highway Patrol radio.

Investigation of the Emergency

All structure emergencies are investigated without delay by the Division Bridge Engineer. The Bridge Inventory Engineer of the Bureau of Bridges and the Structure Maintenance Engineer of the Bureau of Maintenance and Repair are immediately available to visit the scene of the emergency to assist in the investigation, and to advise and consult with the Division Bridge Engineer as to the best method of restoring the highway to the use of traffic.

Engineering Investigation

The investigation is an engineering investigation made to determine the cause of the damage or failure, the amount of damage, and, in the case of damage or destruction by a violation of the law, to place the responsibility where it belongs. Evidence is sought to refute any claim for damage which might be made against the state, or to support a claim for damages on behalf of the State, or to show negligence on the part of the State. Evidence found is recorded in pictures if possible. Pictures showing evidences of collision or impact, skid marks, tire marks, position and condition of vehicle, warning and bridge posting signs, etc., are valuable.

The Ohio State Highway Patrol also makes an investigation in every case involving a possible violation.

Reports of both investigations are filed and used to support the State's claim for damages filed against violators.

Decisions on Method

The Division Bridge Engineer, Central Office Structure Maintenance Engineer, and the Bridge Inventory Engineer decide how repairs or replacements are to be accomplished. The decision they make is subject to approval by the Division Engineer and by the Chief Engineer of Maintenance. The decisions made are based on the amount of damage done and on the needs of traffic. Some of the possible decisions are:

A. Repair the structure if feasible and if it is one of sufficient strength to carry legal loads.

B. Class the work as an addition or betterment in case of a weak structure and repair and strengthen. Structure may also be widened if feasible and the amount of traffic warrants.

C. Replace with an Ohio Department of Highways emergency steel beam bridge from stock in case the structure is damaged beyond repair, or is completely destroyed.

D. Build a temporary run-around bridge for use until a permanent structure can be planned and built by a regular contract.

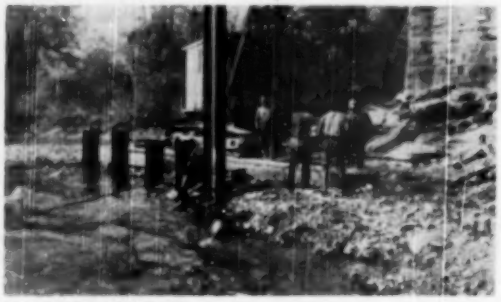
Organization of Emergency Crews

Division Bridge Crews and County Bridge Crews are permanent sections of the Division Maintenance Forces. The Division crew takes care of all major repairs and additions and betterments to structures. The County crew is responsible for normal structure maintenance, and for minor repairs and additions and betterments in the County. A Division Bridge Superintendent is in charge of these crews.

1. U.S. Route 62 bridge. Truck completely destroyed it.

2. Forms for new bridge seat and H-piling in place.

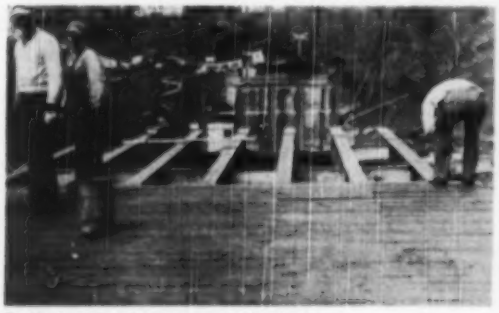
3. H-beams for bents being welded to piling.



4. H-beam welded to pile.

5. Pole derrick and power winch used to place steel for 1st span.

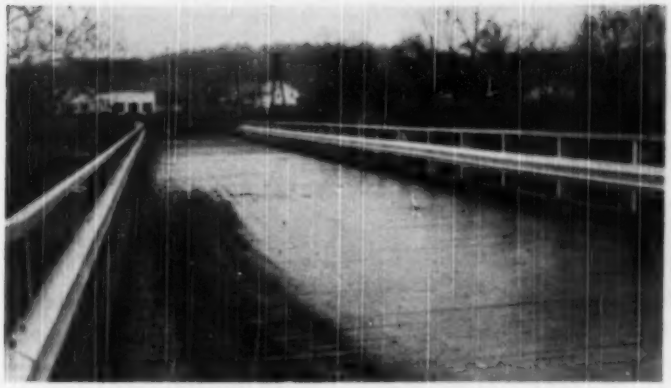
6. All piling in place and pier bents erected.



7. Placing 3" x 6" creosoted wood strip floor.

8. Salvaged truss members used on upstream side bolsters.

(Photos 1 to 9) Ohio US Route 62. High truss bridge of 186'4" span destroyed by collision. Replaced in 14 working days with Ohio Department of Highways standard emergency steel beam spans at a cost of $23,033. Three 50-ft. spans and one 40-ft. span were used.



9. Completed structure before painting and placing bituminous deck. Salvaged 9-in. I-beams for guard rail.

The Division Bridge Crew also functions as the emergency crew in time of need. It may be augmented by one or more of the County Crews whenever necessary.

All-Around Men

The men assigned to this crew are carefully selected for alertness, skill, and willingness to work long hours if necessary and to go to any part of the Division. The men in this crew can "double in brass." The men are skilled in more than one type of work, i.e., the welder may also be a good bridge carpenter and painter; the shovel operator, as a rule, is an operator of several other kinds of equipment; the carpenter may also be a good steel erector. The number of men assigned to a Division Bridge Crew will vary according to the varied conditions in the Divisions. From six to ten men comprise this crew. Needed common labor is assigned from the maintenance crews of the County in which the Division Crew is working.

Equipment Assigned to Crews

The major items of equipment assigned to the Division Bridge Crew are an air compressor and tools, a concrete mixer, an electric welding outfit, a gas welding and burning outfit, a crane and shovel, pile driver leads and hammer, power winches, trucks, water pumps, and blast outfit, a paint spray outfit and a tool house trailer. Other heavy equipment such as a dragline, bulldozer, heavy crane, etc., are assigned from Division equipment when needed.

A handy piece of equipment developed by Highway Division Six, and now being adopted by several other Divisions, is a bridge repair truck. A specially built body on a 5-ton 4x6 truck chassis contains an air compressor, electric welder, front power winch, rear power winch and power take-off, a pole derrick, and compartments for tools, gas welder, and small parts.

Stock Materials for Emergencies

Materials stocked at strategic locations throughout the State consist of the following items:

1. Standard emergency steel beam bridges fabricated for erection as single square spans of 24-ft. width consisting of 8-50', 8-40', 16-30' and 8-20' spans. Any combination of these span lengths may be used for longer spans. Wood pile or steel H-beam pile piers or bents are erected to carry multiple spans.

2. 3"x4" and 3"x6" creosoted wood strip flooring—for 600 L.F. of 2-lane bridge.

3. Creosoted plank flooring—for 1200 L.F. of 2-lane bridge.

4. 440 untreated and 240 treated timber piles.

5. Creosoted timber backing for 24 standard abutments.

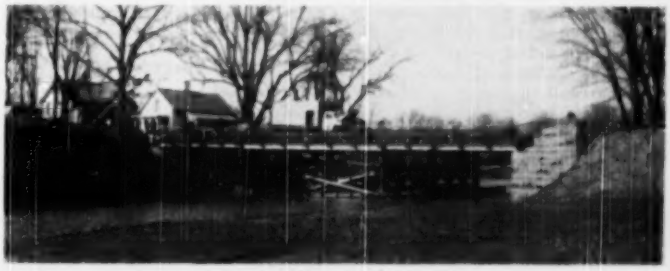
6. 72 creosoted timber caps.

7. A quantity of wheel guard blocks and timber, and railing posts.

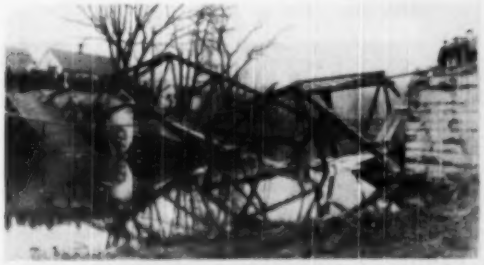
8. A stock of 53-lb. steel H-beam piling for use in constructing abutments, piers or bents, and pier and abutment caps.

9. Steel beam type guard rail for erection as bridge railing.

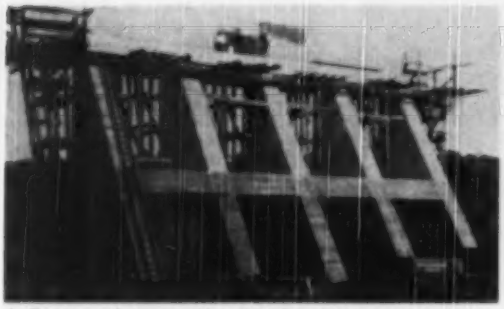
10. A supply of salvaged steel, miscellaneous hardware, paint, etc.



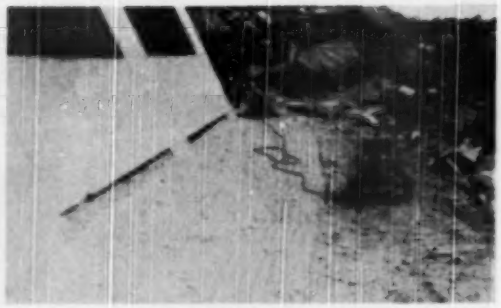
Ohio US Route 42. Bridge completely wrecked by collision. Emergency replacement was made with 3 standard emergency steel beam spans of 30'-40'-30'. Cost $15,545.



★ View of wreckage. Evidence of impact is shown by second vertical member bent over body of trailer. (Right): Showing H-beam pier bents in place and method of bracing pier cap and steel beams for 2 spans in place. Men placing creosoted wood strip floor. H-beams for piers were driven 2½ ft. into shale.



★ Open type abutment at Housatonic River Bridge



★ Appearance of backfill after 96% compaction obtained

Abutment Fill Compacted by Vibrator Unit

PROPER consolidation of backfill material around highway bridge abutments and wingwalls is widely recognized today as a necessary step in assuring a permanently smooth approach onto the bridge. But quite variable are the methods employed to meet specifications on this point. The accompanying photos, hence, are of interest. They show how a vibratory shoe type of soil compactor was used behind large abutments on a current Connecticut bridge project. Mariani Construction Company was the contractor.

The structure, known as the Commodore Isaac Hull bridge, carries the Shelton-Derby-Ansonia expressway over an island at the confluence of the Housatonic and Naugatuck rivers. This island is an accumulation of fine sand and silt offering little bearing value as a backfill material. The governing factors determining the abutment design were cost and weight. The solution of the structural problem resulted in the design of a buried, open-type abutment as shown. With a required fill about 50 ft. in height adjacent to the abutment, proper compaction of the granular backfill material close to the concrete offered another problem.

The compaction was secured here, according to the engineers of the Connecticut highway department, by use of a platform type (Jackson) soil compactor. This unit, which is towed by hand, was able to produce 95% AASHO density of each material lift, usually in a single pass. The operation was based on a travel rate of about 5 to 6 ft. per minute or 10 to 15 sq. ft. of surface per minute, the lift being 12 inches maximum. Periodic checks were made on density obtained, using a density volumeter.

●

(*Continued from page* 56)

of concrete pipe was used for roadway culverts and ditch drains. Under drains along the toe of the cut include 6-in. perforated clay tile and 15-in. c. m. pipe. Cast iron pipe will carry storm water under the railroad bed to the valley.

Run-down ditches were cut with jackhammers, draglines or backhoes depending on their location and the material encountered. A Gradall machine proved handy for ditch excavation, dressing of slopes, etc.

Fast Progress Made

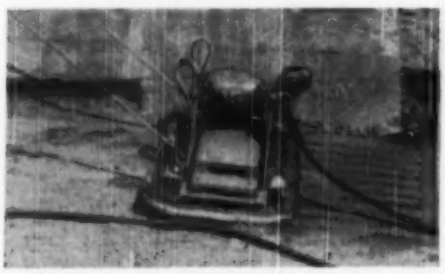
The Harrison contract also includes ramp bridges at either end, three concrete retaining walls, respectively 50 ft., 350 ft. and 350 ft. in length along the railroad right-of-way, and also paving. For structures, clean-up and miscellaneous operations, the contractor used a Lorain motor crane, Caterpillar D8 with Hyster crane, D8 with LeTourneau dozer, International TD-18 tractor with Heil dozer, D4 Caterpillar-Traxcavator and other miscellaneous equipment.

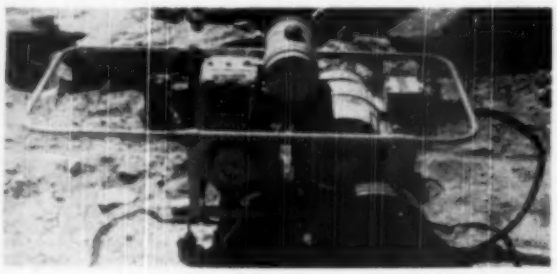
Harrison began work on Nov. 1, 1949, and should complete the job in less than a year; 90% of the excavation and 64% of the entire contract was completed as of July 15, with only 30% of the contract time elapsed. The five 2-yd. shovels worked steadily all winter, reaching a peak of 170,000 cu. yd. during one spring month, working two 10-hour shifts. Progress was slowed somewhat by wet haul roads during the exceptionally rainy 1950 season.

Pennsylvania state highway personnel on the job included Dave Boyers, project engineer; G. J. Summerson, assistant district construction engineer; E. J. Politoske, district construction engineer; J. P. Ambler being district engineer at Pittsburgh. Harris Sheppard is engineer and Walter Yoakum, superintendent for Harrison Construction Company.

Airport Program to be Extended

Cities and states will have longer to complete arrangements for participating in the CAA's federal-aid airport program than heretofore, under a bill passed by the U.S. House and sent to the President for signing. Deadline for application for federal aid to utilizing available funds has been moved from June 30, 1953, to June 30, 1958.





★ The soil compactor used by the Mariani Construction Company

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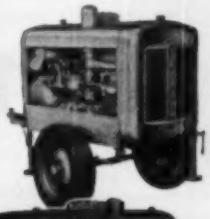
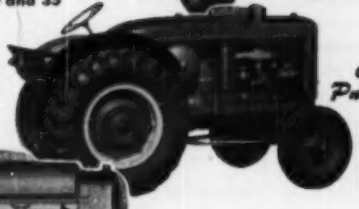
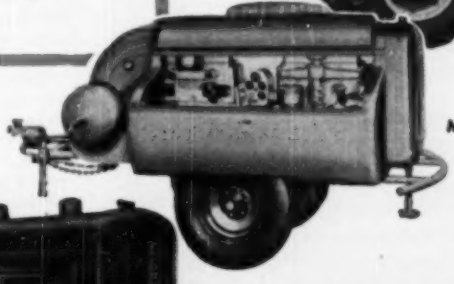
MODELS 20 and 35



MODEL 60



MODELS 60 and 105 *Pneumatractor*



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for hoe and crane operators

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"I like MICHIGAN . . . I wouldn't have bought three of them otherwise. They are very easy on maintenance and easy on the operators."

Comments like these are typical from profit-wise contractors everywhere. Next time you need an excavator crane . . . investigate MICHIGAN and you'll agree it's your best buy! Write, wire or phone for full details.

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480 Second Street, Benton Harbor, Michigan, U. S. A.

Snow Plow Trucks Ballasted for Better Operating Efficiency

(Copyright, 1950, Ernest B. Porter)

THE weight of the wing and hanger on the right side of a snow plow truck must be compensated for on the opposite side with proper distribution of ballast in order to insure equal traction for both left and right wheels.

The Schuyler County (N.Y.) Highway Department has solved this problem on its two-wheel-drive trucks by placing a weight in the left rear corner of the dump body box and slightly back of the left rear wheel. For example, a 1248-lb. concrete breaker was placed in one of the trucks for this purpose. On this side of the fulcrum, approximately one and one-thirds times the actual weight, depending on length and width of dump body, is gained on the left rear wheel. In this way, the weight of the wing is offset and only enough ballast, gravel or crushed stone, is loaded in the box to give proper traction to both rear wheels.

Balanced traction is gained on the left wheels of our 4-wheel-drive trucks by boxing in a space 2 ft. wide the full length of the right side of the dump body. Besides gaining uniform traction on all four wheels, this serves two other purposes. First, by leaving the top of the box down 4 inches, a compartment is created for carrying a tow chain, shovels, etc. Second, by saving approximately one ton of ballast in the void (according to the size of the box and the weight of the aggregate), there is less weight to carry.

Partitions Recommended

To insure proper distribution of ballast, gravel or crushed stone in the dump box, three bins are partitioned off which keeps ballast from shifting.

Trucks should stand on the level with the extended wing raised slightly off the ground while being loaded. Ballast is then placed so that the truck is balanced and sufficient down pressure placed on all wheels to provide proper traction.

Unequal distribution of weight on 2-wheel-drive trucks necessitates more use of tire chains. When both wheels are exerting the same pressure there is little danger from slipping however with greater percentage of weight on the right wheel, the left wheel will spin and often catch causing breakage of spider gears, etc. On four-wheel-positive-drive trucks, the unequal distribution of weight increases the work load on the right wheels to an extent that breakage of universals, etc., often occurs.

Our county's highway department records show that since adhering to the proper distribution of ballast, there has been less breakage and less use of tire chains; also, the snow plow drivers attest that, "the truck has more push, and, in fact, it operates like a different truck."

New Federal Highway Act to Spur State-County Cooperation

On September 7th the President signed the Federal-aid Highway Act of 1950. The Act provides for an appropriation of $500 million for the three major categories for each of the two Federal fiscal years ending June 30, 1952 and 1953.

The authorizations for each of the three categories are the same as provided for in the 1944 Act; Primary $225 million, Secondary $150 million, Urban $125 million.

Regarding the appropriation of $150 million for projects on the Federal-aid secondary highway system, Section 1 (b) provides: "That such funds shall be expended on the secondary and feeder roads farm-to-market roads, rural mail routes, public school bus routes, local rural roads, county roads, township roads, and roads of the county-road class, with types of construction that can be maintained at reasonable cost to provide all-weather service, and the projects for construction shall be selected and the specifications with respect thereto shall be determined by the State highway department and the appropriate local officials in cooperation with each other."

Another provision relating to the use of Federal funds for secondary projects is Section 2 which reads as follows: "Any State desiring to avail itself of the benefits of the funds apportioned for expenditure on the Federal-aid secondary highway system shall establish in its State highway department within six months after the close of the next regular session of its legislature, a secondary road unit and such department shall be suitably organized to discharge to the satisfaction of the Secretary of Commerce, the duties herein required: Provided, That any State highway department may arrange with any county or group of counties having competent highway engineering personnel, suitably organized and equipped to the satisfaction of the State highway department to supervise construction and maintenance on a county-unit or group-unit basis for the construction and maintenance of secondary road projects: Provided

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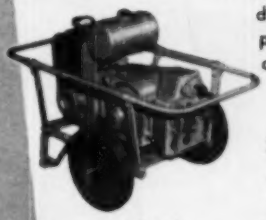
Ask any of the thousands of contractors who use Jackson Portable Power Plants and they'll tell you, practically to a man, that there is nothing that compares with these plants for downright reliability and the ruggedness that provides continuous service, day in and day out with no interruptions.



Model M-1
Capacity: 1.25 KVA

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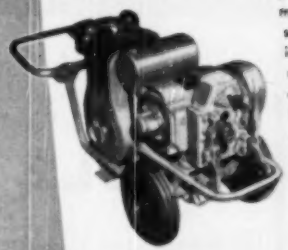

Model M-2
Capacity: 2.5 KVA

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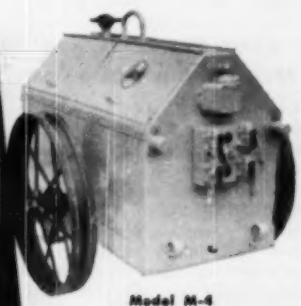
EQUIPPED WITH PERMANENT-MAGNET GENERATORS WHICH REQUIRE NO ADJUSTMENT OR MAINTENANCE — CONTAIN LESS THAN ONE-SIXTH OF THE PARTS IN A CONVENTIONAL GENERATOR.



Model M-5
Capacity: 5 KVA

ELECTRIC TAMPER & EQUIPMENT CO. Ludington, Mich.

further, That the term 'county' as used in this section shall be construed to include corresponding units of government under any other name in States which do not have county organizations, and likewise in those States in which the county government does not have jurisdiction over highways it may be construed to mean any local governmental unit vested with jurisdiction over local highways."

Matching is to be continued on the established 50-50 basis. The Federal share of costs of right-of-way has been increased from one-third to one-half.

Another new provision makes possible the use of Federal-aid funds to retire bonds issued by the states, counties, cities or other political subdivisions where proceeds of such bonds are used to accelerate the construction of toll-free facilities on the Federal-aid primary and urban systems.

H.R. 7941, passed by the House, provided $150 million for the secondary system. The Senate bill reported out by the Committee upped the appropriation to $200 million. President Truman followed this action, demanding that highway expenditures be reduced because of the Korean crisis. Acceding to the President's demands the Senate voted to cut the secondary funds to $135 million. The conferees of the two houses agreed however, on the $150 million figure which was the amount provided for in this bill finally approved by the House and Senate and signed by the President.

The American Road Builders' Association has continually pointed up the inadequacies of our present highway system. It is encouraging to note that in spite of the outbreak of Korean hostilities, Congress authorized an annual increase of $50 million for primary, secondary and urban highways.

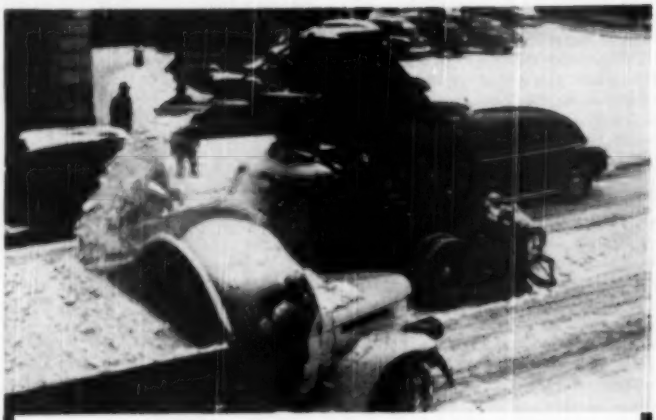
ARBA Plan Enlarged Membership Campaign

Important steps of far-reaching significance toward blueprinting ARBA's future were taken in Washington, D.C., September 14 and 15 when the American Road Builders' Association Board of Directors and important committees met to discuss ways and means of strengthening the organization and broadening its membership base.

Enhancement of interest among present members received as much attention as did the question of how to interest new members in the ARBA program devoted to attainment of "A"

Comparison of Annual Authorizations of 1948 and 1950

	1948 Act	1950 Act
Federal-aid systems:		
Primary	$202,500,000	$225,000,000
Secondary	135,000,000	150,000,000
Urban	112,500,000	125,000,000
Forest highways	20,000,000	20,000,000
Forest roads and trails	17,500,000	17,500,000
Parkways	16,000,000	16,000,000
Park roads and trails	10,000,000	10,000,000
Access roads		10,000,000
Indian roads	6,000,000	6,000,000
Emergency fund		5,000,000
Roads on Public Domain		5,000,000
Inter-American Highway		4,000,000
Tongass Forest roads, Alaska		3,500,000
TOTALS	$511,500,000	$594,000,000



Load Snow the Speedy, Modern Way . . .

with an

EAGLE LOADER

Makes fast work of windrow snow—fills the truck in a jiffy. It's a one-man operated, truck-mounted loader. Gets from job to job at truck speeds.

Handles any stockpile loading, too—sand, cinders, etc., at rate of 3 to 5 yards per minute. Write for full details on this budget stretcher, *now*, so you'll be ready for winter. Catalog RS-10.

EAGLE CRUSHER CO., Inc. GALION OHIO U.S.A.

JAW CRUSHERS · IMPACT BREAKERS
PULVERIZERS · CONVEYORS · LOADERS

continuing highway program on a reasonable and adequate scale, a technically and financially sound basis, and a high business plane." In this connection, the staging of the traditional Road Show, which through the years has served to cement good relationships between the various segments of the highway industry and profession represented by ARBA, came in for a thorough discussion.

Next Road Show

It was decided that a Road Show will be held at the earliest possible date compatible with world conditions; that is, a time and place for the next Road Show will be set just as soon as the international situation permits planning sufficiently far in advance to allow the making of firm commitments regarding exhibits and hotel and convention arrangements. The decision was reached at a joint meeting of the ARBA Road Show Committee and the Exhibit Committee of the Construction Industry Manufacturers Association, the ARBA Manufacturers' Division. H. G. Sours, past president of ARBA and currently chairman of the ARBA Road Show Committee, reported to the Board of Directors of ARBA that periodic reports will be made on the joint efforts and progress of the cooperating committees.

The Special Membership Committee appointed by Col. E. R. Needles, ARBA president, and chairmanned by Lt. Gen. Eugene Reybold, executive vice president, held its initial session during the two days of meetings. In outlining the various facets of a full-scale membership campaign, Gen. Reybold told the committee members:

"The need for more and better highways is so patent that certainly everyone in the highway industry and profession is cognizant of the harmful effects of not streamlining our highways to keep pace with motor vehicle production and use. The size of the road building program needed to meet current and future conditions is so staggering in its proportions that it affords an excellent opportunity to dramatize highways and highway building. Our membership campaign should stress these facts and the additional fact that everyone associated with highway transportation has an obligation to participate in our efforts to step up the highway construction program."

In cooperation with staff members in ARBA headquarters, the members of the Special Membership Committee and other highway industry leaders will write letters and make personal contacts with friends and associates not now participating in ARBA work.

HAISS Material Handling
BUCKET LOADERS

FOUR MODELS
Load 3 to 8 Yards Per Min.

SELF-PROPELLED
SELF-FEEDING

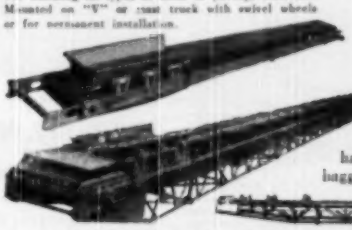
For loading: sand, gravel, stone, topsoil, coal, snow and similar materials. One man operation, wheel or crawler mounted. Furnished with swivel chute or with swivel belt conveyor.

Special new features include: Sealed anti-friction bearings on head and tail shafts, two or four wheel drive, hydraulic raising and lowering, manganese or roller chain.

HAISS CONVEYORS
CAR UNLOADERS

FLAT AND TROUGH BELT CONVEYORS
For handling all types of loose or package materials. Mounted on "V" or semi truck with swivel wheels or for permanent installation.

UNDERCAR UNLOADERS
Designed and built especially for loading sand, gravel, and crushed stone. Combination belt and positive chain drive. Capacity up to 5 tons per minute. Ask for Bulletin No. 501.



SECTIONAL CONVEYORS
Channel or Lattice Frame construction. Made in easily assembled standard sections for permanent or portable installation. All sizes and capacities available for handling all types of aggregates as well as bagged or packaged materials.

For further information, write, 'phone or wire. Experienced Haiss Representatives are located in all principal cities.

GEORGE HAISS MFG. CO., INC., Division of PETTIBONE MULLIKEN CORP.
141st to 144th St. on Park Ave., New York 51, N.Y. 'Phone Mott Haven 5-2200
4700 W. Division St., Chicago 51, Ill. 'Phone Spaulding 2-9300

Manufacturers' Division Expands

The Manufacturers' Division reported CIMA is making good progress toward extending its membership, which carries with it membership in ARBA, and other ARBA divisions enthusiastically undertook similar drives to enroll members from their respective fields. The CIMA Board of Directors met in Washington during the two days of sessions.

One of the actions taken at the Board of Directors' meeting was to combine the Annual Banquet scheduled to conclude the ARBA Annual Meeting in Hotel Schroeder, Milwaukee, next March 14, with the Annual Dinner of the Wisconsin Road Builders' Association, which will conduct its Annual Meeting immediately following the ARBA sessions. Special steps will be initiated to accommodate the unusually large attendance indicated by this combination of activities, which undoubtedly will tax the capacity of the convention hotel. ARBA staff members will work out details with the Wisconsin organization's officials.

●

"The Portland Cement Industry," is a new 61-page illustrated book by Hubert C. Persons, Manager of Public Relations, Portland Cement Association. Written to help cement industry employes and prospective employes know their industry and its job opportunities and requirements better, this volume contains a wealth of information on the industry's history, technology, employment advantages. There is a chapter on the Portland Cement Association. Price $1.00. Discount for quantities. Address publisher: Bellman Publishing Co., 83 Newbury Street, Boston 16, Massachusetts.

A.G.C. Boards Recommend Procedures for Defense and Essential Civilian Construction

Procedures for the guidance of the construction industry and the government to enable general contractors to efficiently carry out all national defense construction while at the same time performing the required civilian volume, were recommended by the Governing and Advisory Boards of The Associated General Contractors of America at their September 11-13 meeting in Chattanooga, Tennessee.

The effects on the industry of changing international and national conditions, with resultant increasing control over the national economy by the government, constituted the underlying tone of the meeting representing over 5,600 leading construction firms which perform an estimated 80% of the nation's contract construction volume.

Construction Capacity Ample

The Boards reported to the public that general contractors have "ample capacity to carry out all defense construction with the maximum of speed and efficiency. In carrying out the largest peacetime construction program in history, the industry has its forces mobilized and available for carrying on the present program and for immediate defense work."

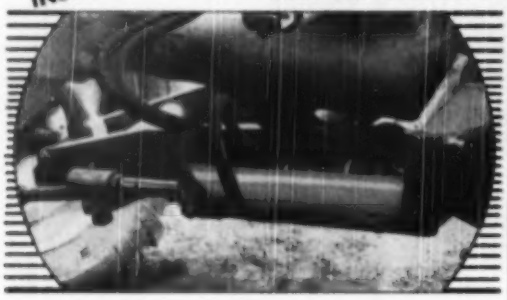
Based on the A.G.C.'s experience in defense construction during World War II, and results of its recent survey of construction conditions which indicate rising prices and growing shortages, its policy-making executives made the following recommendations:

❡ That defense construction be performed through normal industry channels, with fixed price contract awards after competitive bidding wherever practicable in the U. S. and its territories.

❡ That subcontractors and sellers of machinery and materials submit firm

Garrison

HYDRAULIC POWER STEERING BOOSTER INSTALLED ON ALLIS-CHALMERS AD-4 MOTOR-GRADER



- Reduces steering effort to easy one-hand operation.
- Wheel fight and road shock eliminated.
- Mechanical steering in effect with hydraulic assistance.
- Easily installed in the field.

Available in kits for AD-3, AD-4, BD-3 and BD-4 Motor Graders.

Contact your Dealer or Write Direct

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For Modern Low-cost JOINT MAINTENANCE

You'll save time, cut costs . . . with a

TENNANT MODEL G JOINT-CLEANING MACHINE

Helps assure pavement joints of well-sealed, year-round protection. Operated by one man, machine routs out old seal and dirt . . . up to 20,000 lineal feet per day. Cutters clean and roughen side walls for snug, durable bond with modern seals. Easy to use.

Features

ENGINE: 13½ HP Wisconsin 2 cyl, 4 cy. Air-cooled
CUTTER HEAD: 12" diam. case-hardened steel. Revolves at 2400 rpm. 2 sizes. Has 4" cutters, adjustable for joints ⅜" to 4" wide.
OTHER USES: Cleans irregular cracks, removes extruded material, levels humps, stores concrete, brick, etc.

Write today! —for case histories and illustrated bulletins.

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OFFICES IN PRINCIPAL CITIES

Joint-Cleaning Machines
MFRS. OF EQUIPMENT FOR MAINTENANCE OF FLOORS, DECKS, ROOFS, HIGHWAYS

prices wherever possible.

- That fair and just wages be paid to workmen and all steps be taken for greater production, maintenance of wage rates for agreed upon periods of time, settlement of jurisdictional disputes without work stoppages, and for training of adequate numbers of apprentices.
- That general contractors' organizations be kept intact and retain ownership and operation of their equipment for most effective operations in emergency as well as peacetimes.
- That government agencies adopt policies which cause least disruption of normal industry practices and procedures that have been time-proven as the most efficient methods of operating.

Nominations for 1950

Glenway W. Maxon, Dayton, Ohio, 1950 vice president, was nominated for president in 1951, to succeed Walter L. Couse, Detroit, Michigan. Gayle G. Armstrong, Roswell, New Mexico, for 1951 vice president.

Mr. Maxon is president of the Maxon Construction Company, Inc., Dayton, which specializes in heavy construction work. He has been chairman of the A.G.C. Heavy Construction and Railroad Contractors Division, and of the Legislative Committee.

Mr. Armstrong heads the highway contracting firm of Armstrong & Armstrong, Roswell, New Mexico, and has been active in A.G.C. affairs. Formerly chairman of the Highway Contractors' Division and president of the Associated Contractors of New Mexico, he is now chairman of the Public Relations Committee.

Highway Contractors at the A.G.C. meeting discussed the need to use every opportunity to inform the public of the importance of adequate highways to national defense, and the need for continued highway construction; progress on highway planning and construction made by the Joint Cooperative Committee of the American Association of State Highway Officials and the A.G.C.; the need for more adequate state and local financing in the federal airport program; the elimination of red tape being accomplished through work of the Joint Cooperative Committee of the National Association of State Aviation Officials and the A.G.C. in the federal airport construction program; the work of the Joint Cooperative Committee of the American Society of Civil Engineers with the A.G.C.; market opportunities in the Rural Electrification Administration's program of electrification and telephone development; labor relations; and contract termination clauses. The highway report was submitted by N. K. Dickerson, Monroe, North Carolina, chairman of the Highway Contractors' Division.

Motor Freight Gains Top Other Transport

Motor freight transportation has gained more in the past decade than any other form of surface transportation, according to E. D. Bransome, president of Mack Trucks, Inc.

A recent report by the Bureau of Transport Economics and Statistics, Interstate Commerce Commission, Mr. Bransome said, shows the following gains between 1939 and 1949 on the basis of the Bureau's weighted index of inter-city ton miles gained:

Intercity motor carrier, increase	125%
Rail carrier	53%
Water carrier	16%
Pipeline carrier	97%

Mr. Bransome also quoted the Bureau's report to show that in the decade from 1939 to 1949 "the combined index of transportation rose more than did industrial production."

Pennsylvania Road Workers Get Raise

Hourly maintenance employes of the Pennsylvania Department of Highways have been given a cost-of-living wage increase of 10 cents an hour. About 13,000 caretakers, foremen, equipment operators, and other labor will receive the increase.

The longest-lived, most sensitive, trouble-free, low cost bin-level signal ever devised. For every make and type of bin —— and practically every material. One unit operates at top of bin, other at bottom. Long wearing, pressure-sensitive diaphragm actuates micro-switch to turn on signal. Extra heavy construction throughout. Order now from your BUTLER distributor.

IS YOUR PLANT EQUIPPED FOR FULL EFFICIENCY?
Bring your plant to top operation with these BUTLER accessories that expedite production.
AIR JETS. Quick acting, positive, durable.
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BIN GATES. Every type for every material. Rotary, clamshell, roller, radial and quadrant. Keep extra gates on hand.
AUTOMATIC TURNHEAD. Push-button in control. Automatically discharges to any station from one to eight.
CONCRETE HOPPERS. Saves valuable truck waiting-time. Sturdy, easily transported. Low cost repaid quickly.
For further information see your BUTLER distributor or write to
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959 BLACKSTONE AVE.,
WAUKESHA, WIS.

★ Aurora Avenue in Seattle, paved in 1933

Street Economy Record?

1/10th cent per sq. yd. annual surface maintenance cost reported by Seattle for its extensive portland cement concrete streets.

By J. Robertson

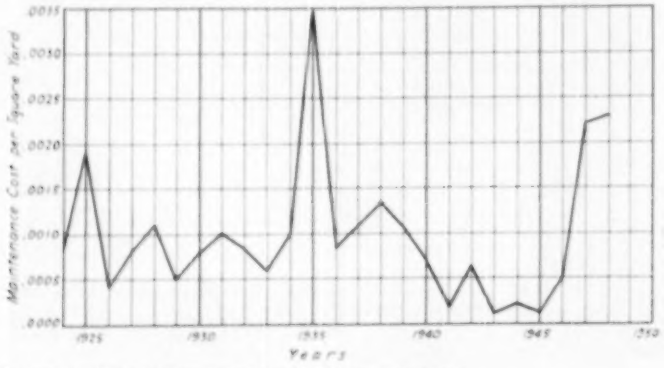
Principal Assistant City Engineer, City of Seattle, Washington

SEATTLE is one of the cities whose maintenance costs are systematically compiled as a guide in answering the question, "How are we doing?" Dating back to 1924 costs per square yard for surface maintenance have been kept, and averages compiled each year for various pavement types.

The maintenance cost per unit on concrete has been lower than on other types of pavement, although some of this cost difference can be attributed to the fact that our other types of pavements are older than our concrete pavements.

During the 25-year period to date portland cement concrete has shown the lowest costs, maintenance for any one year ranging from a low of $.000436 (discounting the wartime figure of $.00013 for 1945) to a high of $.0023. The quarter-century average is $.00098 per sq. yd. per year for concrete and $.00563 and $.00682, respectively, for brick and asphalt. The concrete yardage during this time has risen from 2 million to 11 million square yards.

Seattle has successively moved through the use of various types of street pavements, such as wood planking in its earliest days, sand and granite block types, brick pavement, sheet asphalt, and now, in more recent years, portland cement concrete pavements.



★ Annual surface maintenance costs for Seattle's concrete streets

Since World War I

The use of concrete in this locality dates back to about 1916-18, when concrete pavement of 6 in. minimum thickness was adopted. Previous to this period, the use of concrete as a base course had been common practice.

The primary factor in adoption of concrete lies largely in the fact that in this immediate region the availability of glacial gravel and sand deposits is unequaled by any other section of the country. These aggregates are not only abundant in quantity but also the quality and gradation are very good. Experience with concrete pavements over a 30-year period has been quite saisfactory.

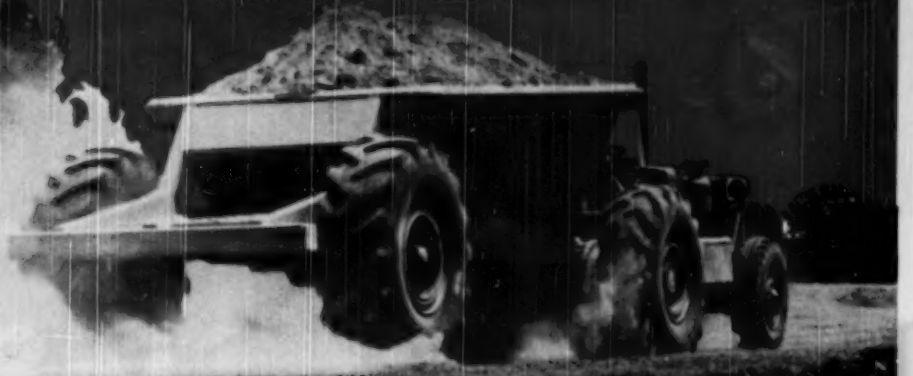
The adoption of a standard has resulted in a fairly large volume of one type of paving being constructed, with the result of a greater skill of workmanship developing among pavement contractors' crews.

With respect to maintenance, we have employed the policy of performing utility cut repairs, patch work and rehabilitation jobs on existing pavements by our own city crews. This practice has resulted in the achievement of high skill by our own workmen, resulting in uniformity of performance as well as a high degree of quality of work accomplished.

At the present time we have some 875 miles of paved streets in the City of Seattle, composed of the following:

(*Continued on page* 72)

Here's Where *SPEED* PAYS OFF!



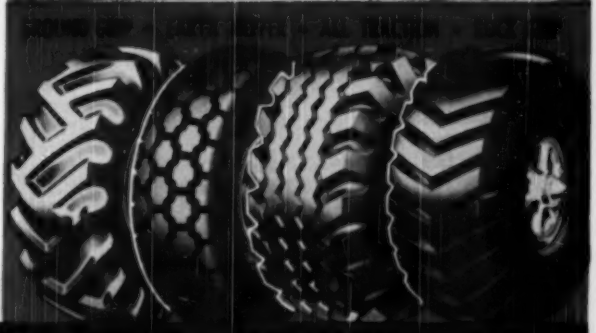
YOU CAN MOVE BIG LOADS *FASTER* on Firestone TIRES

SPEED on the job means profit on the job. You know how much more money you make when you move big loads fast — without profit-killing down-time.

You pile up yardage faster and cut the down-time with Firestone Tires on your equipment. Because their treads are so designed to provide greater productive efficiency and the cord body so engineered to stand up under big loads and high speed operations, Firestone Tires take the roughest punishment and still keep your payloads moving.

The records of off-the-highway operators the country over prove this, and you can prove it too by giving Firestone Tires a trial on your equipment. Let your Firestone Dealer or Store give you all the facts and show you how Firestone Tires will cut your expenses and step up your profits.

Listen to the Voice of Firestone on radio or television every Monday evening over NBC



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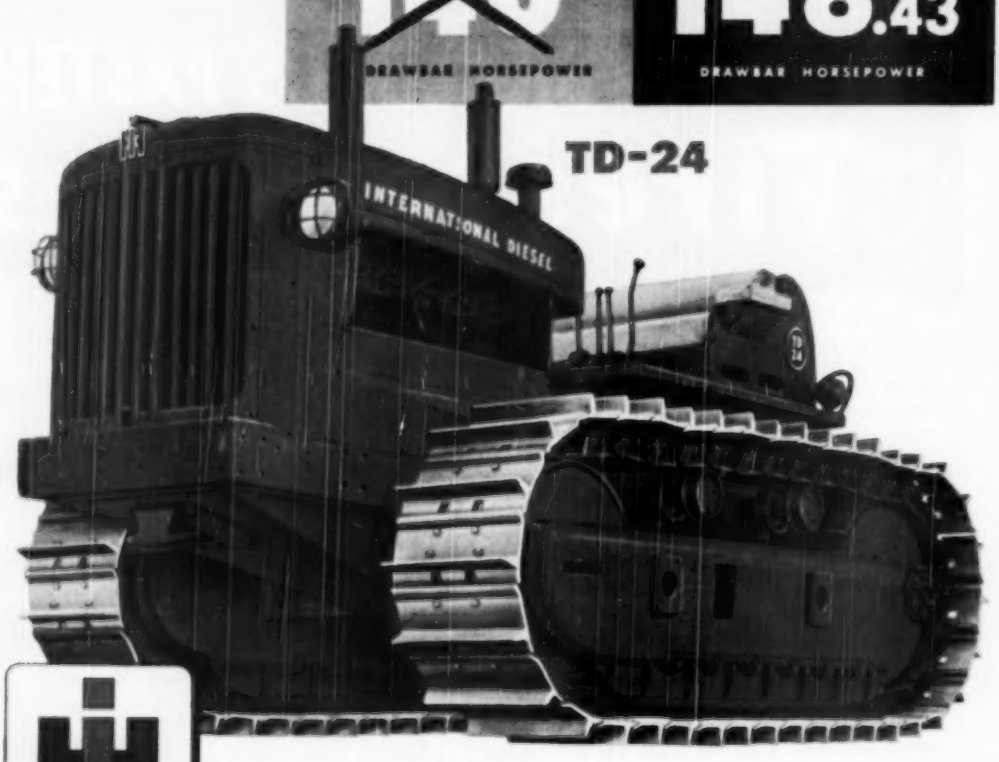
WHEN YOU BUY NEW EQUIPMENT OR REPLACEMENT TIRES SPECIFY FIRESTONE OFF-THE-HIGHWAY TIRES

FIRST OFFICIAL TESTS PROVE....

MORE POWER

ADVERTISED 140 DRAWBAR HORSEPOWER

OFFICIAL TEST 148.43 DRAWBAR HORSEPOWER

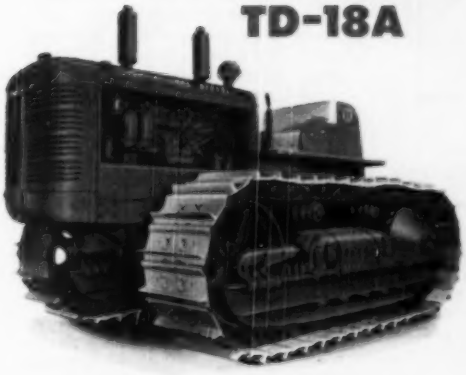


INTERNATIONAL HARVESTER

INTERNATIONAL

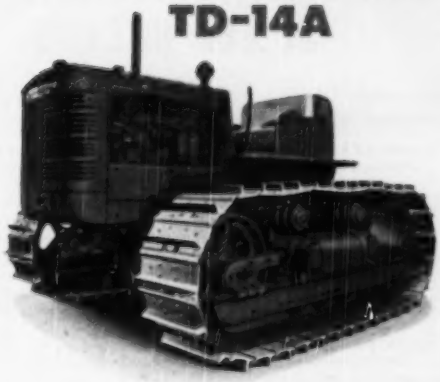
than we claimed!

ADVERTISED	OFFICIAL TEST
~~87~~	89.29
DRAWBAR HORSEPOWER	DRAWBAR HORSEPOWER



TD-18A

ADVERTISED	OFFICIAL TEST
~~60.5~~	65.90
DRAWBAR HORSEPOWER	DRAWBAR HORSEPOWER



TD-14A

INTERNATIONAL DIESEL CRAWLERS GIVE YOU A BONUS OF POWER

Official tests of the three latest models of International crawlers show how conservative International Harvester's advertised horsepower ratings have been.

A board of university engineers tested each of the tractors illustrated and found that it had substantially higher drawbar horsepower than we had claimed—as shown in the figures, above.

No wonder owners have found that International crawlers outwork every other tractor of similar size. No wonder the giant TD-24 has stolen the show on every big job it has tackled.

It is the policy of International to deliver more for the money than buyers expect. That's why you get a bonus—not only in horsepower but also in product quality—every time you buy International.

Ask your International Industrial Power Distributor, or write direct, for copies of the official test reports to aid you in your equipment planning.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

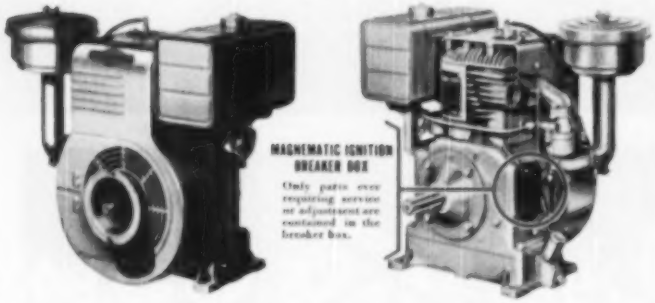
INDUSTRIAL POWER

ONLY BRIGGS & STRATTON HAS THE MODERN

Magnematic Ignition

(Patents Pending)

STANDARD EQUIPMENT ON MODELS 9-14-23



A Dependable Spark For Better Engine Performance at ALL SPEEDS

Magnematic Ignition delivers a dependable spark at lower speeds and better engine performance at all speeds.

LONG SPARK PLUG LIFE — magneto output tailored to engine requirements — sparks only on firing stroke — voltage decreases as speed increases, substantially lengthening spark plug life.

AUTOMATIC SPARK ADVANCE — spark is retarded at starting speed and automatically advanced as engine speed increases.

QUICK, EASY STARTING — pull-up cranking with no danger of a "kick" during rope or hand cranking.

SEALED, WATERPROOF COIL — one piece, plastic insulated coil, fully sealed and waterproofed with molded-in high tension lead.

SIMPLE AND DEPENDABLE — no extra gears, bearings or lubrication system.

EASY TO SERVICE — only parts ever requiring service or adjustment accessible by removing breaker-box cover conveniently mounted outside crankcase.

Magnematic Ignition is another exclusive Briggs & Stratton development which is setting new standards of performance for single-cylinder, air-cooled engines.

Write for bulletin giving complete information on Magnematic Ignition and Briggs & Stratton engines.

BRIGGS & STRATTON CORP., Milwaukee 1, Wis., U. S. A.

4 CYCLE BRIGGS & STRATTON GASOLINE ENGINES

Powered Power FOR INDUSTRIAL CONSTRUCTION RAILROAD AND FARM EQUIPMENT

World Wide FACTORY SUPERVISED SERVICE

In the automotive field Briggs & Stratton is the recognized leader and world's largest producer of locks, keys and related equipment.

(*Continued from page 68*)

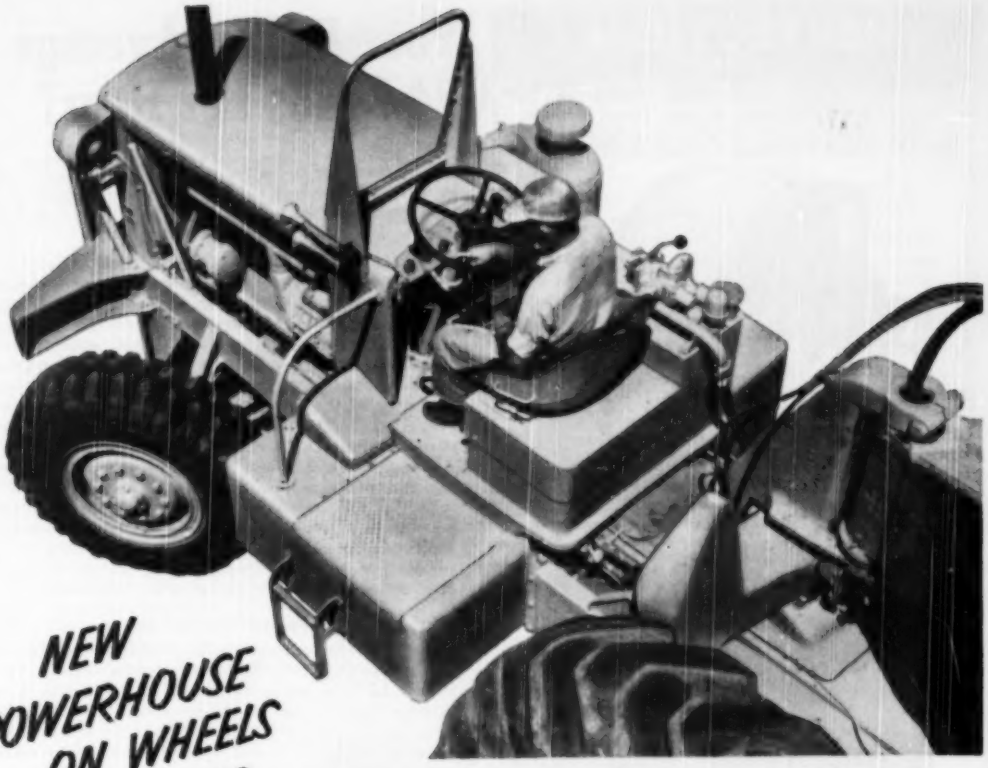
Asphaltic concrete	152 miles
Asphalt	108 "
Stone block	12 "
Brick pavements	1 "
Concrete pavements	606 "

The maintenance of the concrete pavements and the concrete bases is taken care of by the use of 8 maintenance crews. These crews, each composed of 1 truck driver, 1 maintenance laborer, 1 utility laborer and 2 common laborers, are split approximately 4 each, each section under the supervision of a street maintenance foreman whose work covers a sectional part of the city. The two maintenance foremen in charge of the 8 paving crews are in turn supervised by a senior maintenance foreman, whose responsibility is city-wide in scope. With crews of this volume we are able, in normal times, to perform a reasonably satisfactory maintenance operation, although during the war and postwar periods, due to the lack of man power, maintenance standard was not kept to the same degree of efficiency as that presently secured.

With respect to the factors which tend to promote wear on our pavements, it might be well to note that ordinarily Seattle's climate is rather mild, and we do not have the yearly problem of heavy winter weather. The past two seasons brought a rather heavy stretch of cold weather following which our pavements showed a small amount of scaling. This is in spite of good aggregates available for concrete work. This scaling, however, has not developed to the extent that it is serious, although a continued and repeated frost action would undoubtedly cause more scaling.

Foundation and soil conditions are quite varied in Seattle. The fact that they are made up largely of glaciated materials undoubtedly accounts for the wide variance in subgrade conditions encountered. However, where subsoil drainage has been installed, there hasn't been too much trouble with pavement failures due to this cause, except where traffic conditions have been heavier than design factors anticipated. This has been especially true in the past few years where trackless trolleys, which our transportation system has adopted within the past ten years, are operating over the older concrete pavements and other pavement types which were ordinarily designed only as residential pavements. We have found in these cases that resurfacing, usually by the use of asphaltic concrete, has been sufficient to give a longer life on these older pavements.

R. W. Finke is city engineer of Seattle.



NEW POWERHOUSE ON WHEELS HAS SAGINAW HYDRAULIC STEERING

In the construction field this month, interest will center on two high-speed, long haul and high-capacity earth-moving machines by Caterpillar Tractor Company equipped with Saginaw hydraulic steering.

The new units are the four-wheel Diesel tractor-wagon combination, the "Cat" DW20 Tractor with W20 Wagon and the "Cat" DW21, a two-wheel Diesel Prime Mover equipped with a No. 21 Scraper.

Saginaw Hydraulic Power Steering

Easy operation of the steering wheel for short turning is accomplished through Saginaw shockless worm and recirculating ball nut steering, with hydraulic booster that follows the natural "feel of the road" hand guidance.

A non-stop turn is negotiated in a width of 50 feet. Heavy steel stops prevent gooseneck from jackknifing.

A "Natural" for Saginaw

Millions of applications of its recirculating ball principle in the automotive, airplane and other industries have established *Saginaw Steering Gear* leadership. Our engineering service is available to motor and equipment manufacturers who require ease of operation and precise control in the steering of vehicles or the movement of mechanisms.

Saginaw

STEERING GEAR DIVISION

General Motors Corporation, Saginaw, Michigan

SSG PRODUCTS

STEERING GEARS AND LINKAGES • PROPELLER SHAFTS • TRANSMISSION CONTROLS • TURN SIGNALS • DIESEL ENGINE PARTS • BALL BEARING SCREW AND NUT ASSEMBLIES • AUTOMOBILE JACKS

PERFECTION
THE NAME TO REMEMBER
JOB ENGINEERED IN 1918

32 YEARS OF KNOWING HOW

JOB ENGINEERED IN 1950

Thirty-two years ago PERFECTION Steel Dump Bodies and Hydraulic Hoists were in the pioneering stage—and being carefully job-engineered to the new but comparatively light requirements of that period. But modern tremendous job requirements are a far cry from those pioneering days. To keep pace with modern demands, PERFECTION applies 32 years of specialized job-engineering experience to every detail. When you buy Perfection Bodies and Hoists, you get a combination that's job-engineered for utmost efficiency and economy.

Photo shows a modern PERFECTION No. 354 Special "inside braced" Dump Body with Isa-Double ROLL A LIFT. Can be made in various sizes.

Write for an enlarged mounted photo of the old truck pictured in this ad. No obligation. This is No. 3 of a series—if you want a set of these, ask for Nos. 1, 2, and 3.

THE PERFECTION STEEL BODY COMPANY
Galion, Ohio, U. S. A.

PERFECTION
STAKE and DUMP BODIES
HYDRAULIC HOISTS

FOR ANY TRUCK
STANDARD or SPECIAL UNITS
IN ALL SIZES - FOR ANY USE

Your Pusher Average 24 Loads Per Hour?

This is the average dozer operating cycle of pusher and puller crawler tractors, working in conjunction with rubber tired tractor-drawn scraper units, as timed on highway grading jobs in Eastern and Southern States

EQUIPMENT production studies made during the past year on pusher and puller crawler tractors, working in conjunction with rubber tired tractor-drawn scraper units on active rural highway grading jobs, show that each pusher or puller gives assistance in the loading operation on the average of 24 times per hour. These studies were conducted by the Production Cost Unit of the Bureau of Public Roads. The data presented as Report No. 15, Committee on Highway Construction and Maintenance Methods, Highway Research Board. The data represent a composite summary of the observations made under a variety of job conditions and management practices. No endeavor has been made to present selected data for the purposes of enabling comparisons of performance to be made between various operating procedures or with other types or classes of equipment under identical operating conditions.

Several Tractor Sizes

The studies cover operations of 9 large pusher and puller crawler tractors, from 80 to 140 drawbar horsepower, on seven jobs in eastern and southern states working in conjunction with rubber tired tractor-drawn scraper units. The scrapers ranged in size from 8 to 13 cu. yds. struck capacity drawn by 2- and 4-wheel rubber tired tractors having 110 to 135 drawbar horsepower. On the projects studied each pusher or puller tractor worked with two to four scraper units.

The pusher or puller cycle time is considered to be the interval of time from the point where a given scraper unit is engaged and aided in loading by the pusher or puller tractor to the point where the next scraper unit is similarly engaged. Time spent in pushing or pulling during the loading operation, backing, turning, engaging, and miscellaneous waits and delays are considered as cycle elements.

Data were obtained by timing several hundred cycles. The character of excavation varied on each job as well as

Table 1. Cycle elements of pusher and puller crawler tractors

Item No.	Time element per cycle	Time in minutes Range	Average
1	Assist in loading scraper unit by pushing or pulling	0.9-1.4	1.1
2	Maneuvering: backing, turning, and engaging	0.5-1.2	0.8
3	Waiting for next scraper unit	0.0-1.0	0.4
4	Minor delays	0.0-0.8	0.2
5	Total cycle	1.5-3.2	2.5

Table 2. Comparison of loading and maneuvering time for pusher and puller crawler tractors

Item No.	Time element per cycle	Time in minutes Pusher operation	Puller operation
1	Assist in loading scraper unit	1.12	0.98
2	Maneuvering: backing, turning, and engaging	0.79	0.89
3	Total, items 1 and 2	1.91	1.87

as between jobs from "easy digging" in loose, light, bulky materials to "hard digging" in compacted clay or rocky materials. The ranges shown in Table 1 are job averages. On several of the projects the variations exceeded the ranges which are shown. For example, the maneuver time may have varied from 0.2 to 2.3 minutes, but only the over-all job average was considered when listing the entries in Table 1.

Total cycle times shown for item 5 in Table 1 indicate that each pusher or puller gives assistance in the loading operation from 19 to 40 times per hour or an average of 24 times per hour for all jobs combined.

A multiplicity of operating procedures was observed which precludes any detailed discussion of the individual cycle elements. It is interesting to note, however, that there is very little difference between pusher operation and puller operation for the time spent in loading and maneuvering. A comparison is shown in Table 2.

Sufficient studies have not yet been made to warrant analyses of the individual effect upon scraper cycle elements and pay yardage per load of such factors as type of operation (pushing or pulling), size and type of pusher or puller, kind of materials, grades, ground conditions, operator efficiency, and so on. Future reports on these matters will be issued at such time as a sufficient number of studies are made to afford more positive indication of the effect of these factors.

Warped Beams Straightened by Reverse Warping in a Hurry

Quick thinking on the part of F. H. McGraw & Company's trouble shooter, made possible an on-the-job repair recently that saved approximately $20,000. The job was a large structural project.

Steel beams used in the construction had had clip angles welded onto them at the fabricating plant. The angles were to receive and provide expansion space for a glass block wall. This operation had caused a horizontal warp in some fifty of the beams and channels—the warp varying from ⅝ to 1⅝ inches at the center.

Since the steel frame was complete and brickwork in progress, it was necessary to devise some method of straightening the warped members, or else dismantle them and send them to a distant shop for straightening in a heavy press. This latter procedure would not only have been costly but would have delayed progress.

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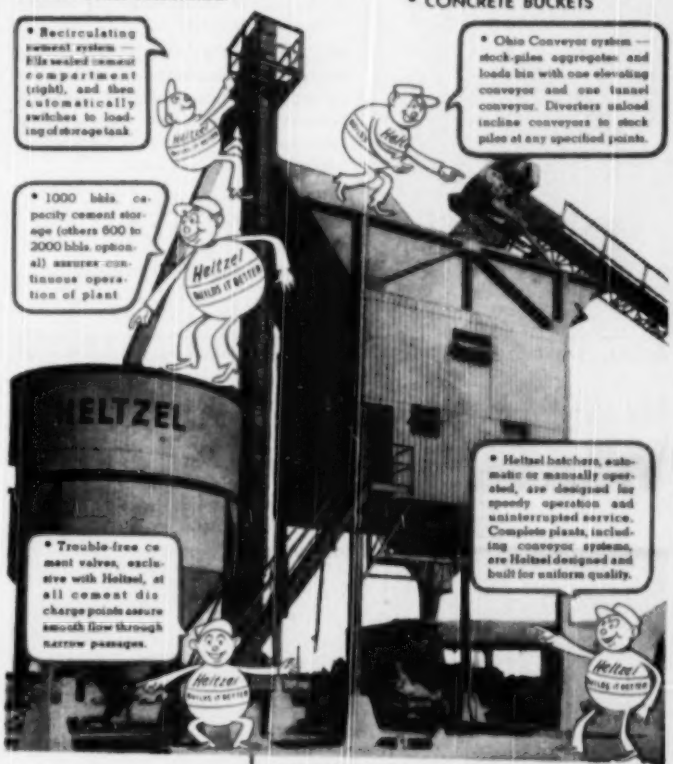
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The warped members were 18-in., 55-lb. I-beams and 15-in. 33.9-lb. channels. They were all outside lintels with a continuous span of 22 feet. Two men applied heat with oxy-acetylene welding torches to one of the beams at the midpoint, the idea being that the stress developed by the heat would produce a force that would bring the beam back into shape.

By focussing torches on the midpoint on both the upper and lower sides of the bottom flanges, heat was held for 60 seconds. At the same time every effort was made to contain the heat patch so as to control the push. The beam was heated to a range between cherry and white hot. In a few minutes the beam jumped back into position. Trueness was checked with a piano wire as a line.

Where the warp was between ⅝ and 1¼ inches heat was applied to the midpoint only. On sections where the warp was greater, the treatment required subsequent applications to the quarter points. In applying this method, special care was taken not to use a cutting torch, as the accidental opening of the cutting valve would instantly cut a hole in the beam.

Two Scrapers Handle 220 Cu. Yd. Hourly

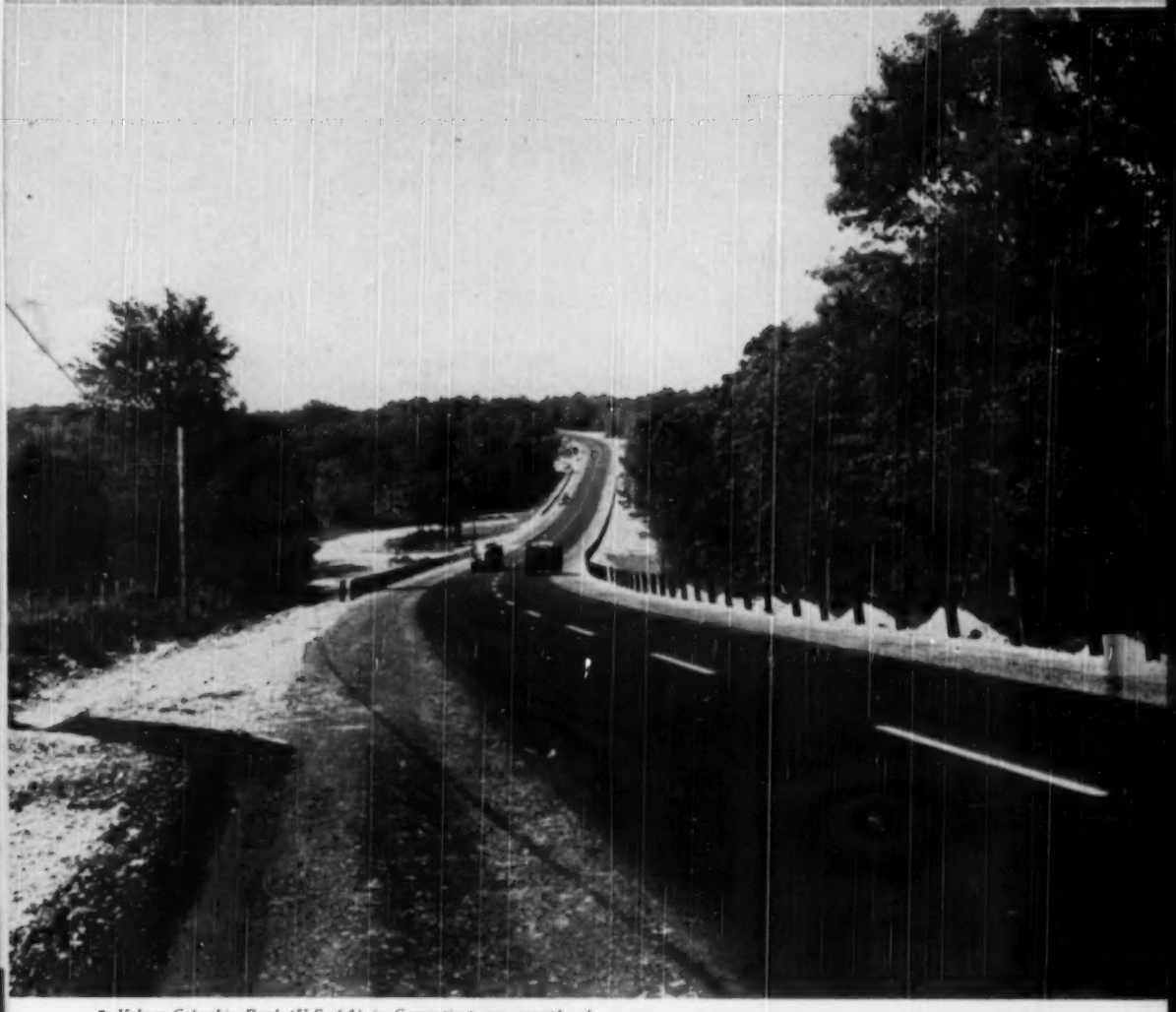
Wylie Bros. of Albuquerque, N. M., contracted to move 163,000 cu. yd. of red sandy clay on the building of new sections and widening of others on a 17-mile stretch of U.S. Highway 62-180. The job, located east of Hobbs, N. M., was done for the state highway department.

To move 90% of this material, Wylie Bros. used two C Roadster Tournapulls wtih E16 Carryall Scrapers. The machines were push-loaded in roadside borrow pits, traveled 500 ft. to the right-of-way, made sharp turn through a gate onto open traffic blacktop highway which served as a haul road. According to the contractor's records, each unit hauled 10 pay yards per trip, averaged 11 trips an hour for a combined output of 220 pay yards hourly on the 7500 ft. cycle. The round trip averaged 5 minutes.

These same Tournapulls, operating on a previous road job 20 miles south of Hobbs, had just moved 130,000 cu. yd. of brown blow sand in less than three months. After completing that job, the Tournapulls were driven 20 miles over the highway, traveled through Hobbs and 5 miles east to the new job site in 1¼ hours.

Good Roads for National Strength and Security

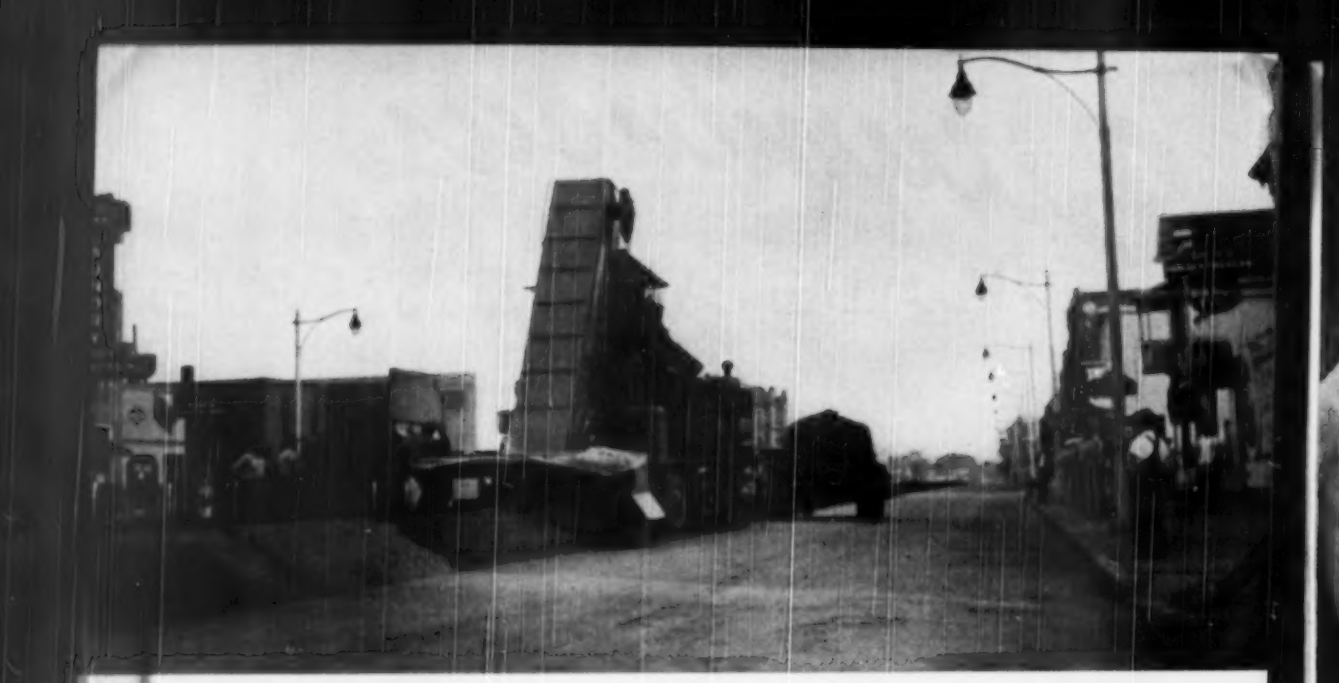
Bituminous ROADS AND STREETS



● *Hebron-Columbia Road (U.S. 6A) in Connecticut—an example of highway evolution. See another page in this issue for panel of three striking photos of this road, taken from this spot in 1900, in 1925 and in 1950*

OCTOBER, 1950

Timely articles on bituminous subjects (beginning page 81): Mile-A-Day Blade Mix Methods . . . New Rapid Stability Test for Hot-Mix



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WIDE economies
AND
HANDSOME durable roads

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A 6-inch briquette of paving mix is tested on a Hubbard-Fields Stability Machine . . . to determine the shear strength of the compacted mix.

Penetration test determines the hardness of an asphalt cement.

Soaked soil briquette is tested in a California Bearing Ratio Stability Machine to determine thickness of base and wearing course required above compacted subgrade.

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MARATHON

The OHIO OIL Company . *Asphalt Department*

FINDLAY, OHIO • LOVELL, WYOMING • Producers of petroleum since 1887

★ Highway 32 resurfacing, Oconto County. Three graders making initial spread of half of the gravel windrowed on one shoulder

Mile-a-Day Blade-Mix Methods

—as Seen in Oconto County, Wisconsin

Experienced crew makes good time with outfit consisting of four motor graders, two pulverizing mixers, two distributors and two rollers, in rebuilding oiled gravel mats on primary roads

By Ed Kuschel
Highway Commissioner, Oconto County, Oconto, Wisconsin

FOLLOWING is an outline of methods by which our county road organization produces a mile of good black-top highway per day. These methods were used during the past season in resurfacing 22 miles of 22-ft.-wide mat on state highway 32 through Oconto County, Wisconsin.

On Highway 32, which represented a typical project, about 1,000 cu. yd. of gravel was added per mile to thicken and strengthen the roadbed; this yardage giving a lift of 2½ to 3 inches. Portions of the old road found to be corrugated or raveled were scarified and the old material thoroughly pulverized and mixed with the new, using motor graders and pulverizing mixers. Granular material used for the lift contained about 40% sand and 60% gravel crushed to pass a ¾-in. screen. Crushing and hauling for this project was done with county men and equipment, although on some of our projects contracts are given to contractors in the vicinity who are in a position to bid favorably.

The aggregate is delivered to a windrow along the left shoulder of the road to be resurfaced, while scarifying of the old mat sections is in progress. Windrowed material is watched closely for moisture content, and if moisture exceeds approximately 30%, the material is turned over and mixed by one or more passes of motor graders and mixers, much as in the subsequent processing.

We almost invariably process half the roadway width at a time, as an accommodation to traffic and for efficient performance of the work. The grader operators first lay out about half the windrowed material, or about 500 cu. yd. per mile. We find that mixing this quantity gives the operators the opportunity of running their machines at a higher rate of speed, and with better results, than when larger quantities are handled. The 500-yd. windrow results in a better mixture, in our experience, and is picked up and handled easier by both the blades and the mixers.

The step-by-step process from here on is as follows, applied to work sections about one mile in length:

1. A grader cuts away half the windrowed material and flattens it to a width of about 10 ft.

2. Bitumen is applied to this strip, using a 1,000-gal. distributor tank with 10-ft. spray bar mounted on a heavy truck. A second distributor unit is always kept coming up, to insure a continuous, uninterrupted passage through the work section. Between 14,000 and 16,000 gal. of oil is used per mile. This is a light spray and it mixes easily. The aim is to apply about 15 gal. per cu. yd. of gravel. Various materials are used, depending on their availability and on conditions encountered. These include SC-6, SC-7 or MC-3 asphalt and RT-6, RT-7 or RT-8 tar. Application is at 225 to 250 deg. F.

This gallonage is found satisfactory for a 2½-in. mat of 40%-60% materials.

3. Following immediately behind the distributor is a second motor grader. This machine windrows the

Oconto County's Maintenance Equipment used on Highway 32

- 2 Adams motor graders
- 1 Austin-Western 99 grader
- 1 Caterpillar No. 12 Grader
- 2 Seaman pulverizing mixers
- 1 Case tractor (for pulling mixer)
- 1 Massey-Harris farm tractor (for mixer)
- 2 FWD trucks with 1,000-gal. distributors mounted in dump body beds
- 1 10-ton Galion roller
- 1 5-ton roller
- 1 Pioneer portable crushing plant with primary crusher for large stones
- 1 Lorain shovel in pit

About 10 trucks haul gravel for windrows from pit to job. These include 4 FWD's, carrying 6 yd. of aggregate, 2 Chevrolets of 5-yd. capacity and 4 Fords of 5-yd. capacity.

oiled gravel to the right. By following right behind the spray bar it is able to peel up the sticky exposed material and leave a dry travel path for vehicles passing through the job.

4. A mixer attached to a light tractor processes the windrowed oiled material, mixing it and blending it thoroughly.

5. Grader No. 3 throws the mixed material back to the left, followed by another tractor-drawn mixer and by grader No. 4.

6. This process continues until the correct percentage of oil is well mixed and the mix is of a consistency satisfactory for laying. The graders then spread the material out on the half of the roadway being processed.

7. The crewmen blade the remaining stockpile windrow material across to the far right half of the road, and the foregoing process is repeated until the mixing is completed on both sides entirely through the mile section.

8. The full 1,000 yd. per mile of mixed material is combined into a single windrow, leaving the road bare, and a bituminous tack coat is applied in two 11-ft. passes. All four motor graders are pressed into service in tandem immediately behind the distributor, to prevent traffic from driving over the exposed tack coat.

9. One grader is left behind to lay out the mat. Five or six trips are usually necessary for a skilled operator to secure a smooth, well crowned surface.

10. Immediately after the laying out, rolling commences. We always roll working from the outside toward the center, so as to keep a proper crown. If weather permits, a 10-ton roller is used. But the mix has a tendency to shove ahead of a heavy roller when the weather gets too warm. In hot weather therefore a 5-ton roller is resorted to. Three or four passes are required to obtain the desired finish and density. Equipment consists of tandem steel rollers carrying 50 to 75 gal. water tanks and spray bars to dampen the rolls, in order to prevent rolls from picking up particles of road mat.

11. A seal of RT-7 or RT-8 is placed after a year of traffic use. Before ap-

Step-by-Step—Highway 32 Job in Oconto County

★ Pulverizing mixer making mixing pass after passage of oiling and windrowing gravel for one lane

★ Far grader is manipulating oiled mix; two nearest graders working dry gravel toward center for oiling

★ Here material is oil-processed and ready for spreading and compacting on left half the roadway, while grader windrows dry material preparatory for oiling the other half

★ Bituminous spray bar applying oil to material laid out over far half of road. Note how closely the graderman follows, peeling up oiled layer into a windrow

Plant Stability Test

For Hot-Mix Asphaltic Concrete Mixtures

By Dr. Ting Ye Chu
Research Associate, Iowa Experiment Station
and M. G. Spangler
Research Professor of Civil Engineering, Iowa State College, Ames, Iowa

A new method of testing for the control of asphaltic concrete mixtures at hot-mix plants is suggested. The unique feature of this test is the rapidity of its operation. Time from the molding of the specimen to the end of testing is about ten minutes.

A single mold has been developed for both molding and testing which eliminates the need for extruding the specimen. In addition, an armored thermometer is used to measure the temperature of a specimen before testing. It is not necessary, therefore, to keep a specimen in a hot water bath or constant temperature oven for a certain period as required in ordinary stability tests.

These two developments give a rapid field stability test to help the plant inspector keep better control over the asphaltic concrete mixture at hot-mix plants.

STABILITY tests have long been employed as aids in the design of asphaltic concrete mixtures. By such test, it is possible to select better materials and to find their optimum combination, so that mixtures of high quality can be expected. Common stability tests for such a purpose are the Hubbard-Field, the Hveem, and the Marshall test.

Although the design of mixture is a necessary step for securing a quality asphaltic concrete pavement, control of the mixture at producing plants is no less important. At asphaltic concrete plants, it is hardly possible to keep everything exactly the same as has been assumed in the design. Whenever deviations from the design condition occur, it is possible that the quality of the mixture may be impaired even if such deviations are within specification limits. It is the duty of a plant inspector to check the quality of mixtures produced and, if necessary, adjust the mix-formula.

In the prevailing practice for asphaltic concrete plant inspection, mix samples are sent to a nearby laboratory, where they are reheated, molded, and tested. The inspector cannot get test results from the laboratory until one or more days afterward. In case the mixture is found to be unsatisfactory by the laboratory stability test, it may be too late for adjustment because a large quantity of mixture has already been produced and laid. Furthermore, any delayed adjustment based upon tests of the mixture of one day might be improper for the mixture of another day, since it is almost impossible to keep everything constant, especially at continuous plants. Therefore, there is an urgent need for a fairly accurate but very rapid stability test which can be conveniently performed at the plant.

This paper is a progress report on a research project whose purpose is the development of apparatus and a technique for testing asphaltic concrete mixtures at a hot-mix plant with sufficient accuracy and speed to enable a plant inspector to supplement his judgment with factual data. A test is suggested [1] which appears to have considerable merit for the above stated purpose. It will be called the plant stability test. This test is suggested primarily as a field control test and is not intended to supplant the presently used laboratory tests for the design of mixtures. It is recognized that a few of the currently used stability tests, such as the Marshall Test, are sometimes used for controlling mixtures at hot-mix plants. However this test is designed for more rapid operation and requires less equipment.

This paper was presented at the 29th Annual Meeting of the Highway Research Board, December, 1949, and is published by the Board in Volume 29 of its Proceedings.

[1] Italicized figures in parentheses refer to the list of references at the end of the paper.

Test Mold Details

Since the primary requirement of a field test is rapidity of operation and simplicity of equipment, it is difficult to adopt any analytic test for this purpose. Therefore, the suggested test must be empirical. Nevertheless, in designing the test mold, efforts have been made to simulate as much as possible the actual pavement loading condition. Considering a block of bituminous pavement under a wheel load, it is obvious that this block will receive vertical compression from the wheel and a corresponding reaction from the base. These two vertical forces are simulated in the compression test developed by Vokac[2]. Besides these, certain side pressures are exerted by adjoining pavement masses. To simulate more closely the pressure situation in a pavement under load, it is desirable to provide for similar side pressures in a stability test. However, distribution of such side pressures follows no definite pattern. When the wheel is accelerating or decelerating, the distribution of the side pressures will be influenced accordingly.

A common practice is to assume

plying seal the surface is thoroughly cleaned with a power sweeper. The seal is applied at the rate of about 1,500 gal. per mile of 11-ft. width. A cover coat of coarse (⅝-in.-max.) sand is immediately applied using about 45 cu. yd. of sand per mile of 11-ft. lane. Sand spreaders are attached to both small trucks and our large snow plow trucks for this purpose. One side at a time is closed off during sealing.

All bituminous material shipped to us for state, federal or county roads are tested at their source. In Wisconsin, all tars and oils must be up to specifications issued by the state highway department.

We weigh our aggregates to be sure we have the correct percentage of sand and gravel. If we find too much sand is being run through we use a sand rejector attached to our crusher.

Laying one mile of black top costs around $3,600. One cannot give exact figures on this because gravel may be a few cents more or less per cubic yard, and haul will vary. This estimate is for a six-mile haul and aggregate at $.08 per cu. yd.

Carrier Mills, Illinois — June 6, 1950

How to make rough roads smooth with great savings in time and money was demonstrated here today by an Athey Force-Feed Loader-Portable Breaker team. These facts and figures show what happened.

Width of road — 22 feet.
Length of reworked strip — 450 feet.
Scarifying depth — 6 inches.
Cubic feet windrowed material per lineal foot — 3.
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Average oversize — 3½".
Average time required per windrow to pick up, reduce and return to subgrade by Athey team — 123 minutes.
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The Athey team made the difference between a rough and a smooth road . . . used the material in the old road . . . saved many hours of work, many miles of material hauling, many material and labor dollars.

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uniform distribution of side pressure as has been done in the triaxial and Hveem Stabilometer test. Both tests are valuable for design or research work, but it seems impracticable to apply them directly or in modified form as a control test at asphaltic concrete plants. In order to meet the requirements of a field test, and more nearly conform to the facts relative to the existence of both vertical and side pressures in a pavement, a type of semi-confined compression has been chosen as the basis for the plant stability test. In other words, certain side pressure is furnished in addition to the uniform vertical pressure. Since the plant stability test is empirical, the merit of such arrangement has to be verified by laboratory experiments and practical application.

Based upon the foregoing, a test mold was designed with several unique features (See Figs. 1, 2 and 3). One is its versatility. It can be used for both molding and testing. In ordinary stability tests for hot mixtures, the specimen is prepared in a mold. After molding, the assembly has to be cooled in water for a few minutes and then the specimen is extruded from the mold. By using a single mold for both molding and testing, no cooling of the assembly or extrusion of specimen is necessary. Therefore, this particular type of mold helps to reduce the time required for the test.

Specimens used have been 4-in. in diameter and 4-in. high. The height-diameter ratio is always a subject of great controversy. In the Hveem Stabilometer test, a ratio of about 0.6 is used. Vokac[5] made a series of experiments and suggested a maximum value for D/H of 1.33, which is the same as specifying a minimum value of 0.75 for H/D. On the other hand, Pfeiffer[6] and Nijboer[7] criticized all tests using specimens with low height-diameter ratio. They pointed out that, in tests of such specimens, a disturbing effect would be caused by the friction between the steel bearing plate and the ends of the test specimen. Their suggestion is to use the ratio 2 as a minimum.

Research Continues

Further study of this detail is underway, but for the present, the value unity is tentatively adopted for this ratio. When field application is considered, the difficulty in molding might be the practical limitation for increasing the height of specimen.

During testing, vertical load in the direction of the cylindrical axis of the specimen is applied. The compressive strength of the specimen is defined as its stability, which, considered a

good indication of the mix quality. Attempts are being made to include deformation characteristics of the specimen under compression. By examining the stability and deformation, one should be able to predict the service behavior of the corresponding mixture. In this paper, discussion will be limited to stability only.

A very important requirement for a stability test is high sensitivity to all factors affecting the quality of mixture. Sensitivity of a test depends upon various factors such as the test mold, the method for preparing the specimen, the testing speed, etc. Among these factors, it appears that the test mold is the most essential one. In investigating the sensitivity of the mold, other factors have to be held constant. Since the plant stability test is somewhat similar to the unconfined compression test used by the Bureau of Public Roads (4), it was decided to use the same method in regard to preparation of specimen and speed of testing as has been used in the unconfined compression test.

Good Background

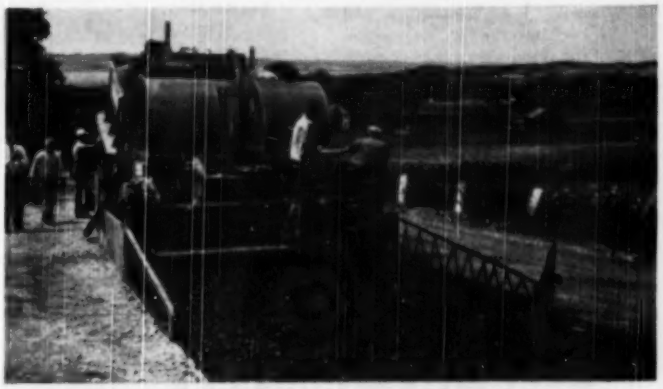
The complete series of sensitivity tests has not been completed and no definite comparison can be made between the suggested test mold and other testing devices used in stability tests. However, preliminary tests have been performed and there is enough background to believe that the test mold can reflect all variations with respect to type and grading of aggregate and filler, type and percentage of asphalt, density of mixture, etc.

In order to compare the suggested mold with other testing devices, one set of test results is shown in Fig. 4. Asphalt cement of 70-85 pen. was used as binder and ¾-in. crushed stone as coarse aggregate. The size of specimen was 4-in. by 4-in. for both unconfined compression and plant stability tests, 6-in. in diameter and about 2-in. high for the Hubbard-Field test (5), and 4-in. in diameter and 2.5-in. high for the Hveem Stabilometer test (7, 8). All specimens were prepared by applying a static load of 3000 psi. maintained for 3 min. The speed of testing complied with that specified for the various tests. An automatically controlled water bath was used to regulate the temperature of the specimens at 140 deg. F. before testing. Stability values are the average of the test results for three specimens.

It is seen from Fig. 4 that an optimum stability is indicated in all curves except that for Hveem Stabilometer test. This is one of the characteristics of the Hveem test (7). Since specimens of the same size were used for both the unconfined compression and the plant stability test, it is interesting to compare their results. The stability curve for the plant stability test magnifies the general character of the unconfined compression test. When field application is concerned, this magnification is advantageous. Since portable testing machines are far less sensitive than laboratory stationary machines, magnified stability readings tend to give a clearer indication of the quality of mixture.

Another unique feature of the plant stability test is the technique for molding the specimen and the method of measuring its temperature at the time of testing. Although further studies are underway, the following practices relative to the mold temperature, compactive effort, density of the specimen and temperature control at the time of testing are tentatively recommended.

With respect to the temperature of the mold, there is no universal agreement as to the optimum relationship between this temperature and that of the mixture. The purpose of using a



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hot mold (same temperature as the mixture) is to avoid sudden chilling of the mixture as it comes into contact with the mold. Usually, specimens prepared with a hot mold will have a smoother surface. However, the formation of the smooth surface may be the result of segregation in the mixture. In other words, there may be a concentration of asphalt mortar and free asphalt close to the mold, and consequently a deficiency of mortar and asphalt in the nearby inside region of specimen. The effect of this segregation may be very small. Nevertheless it can be considered as an advantage for using a cold mold (at room temperature). In that case, asphalt mortar and free asphalt will not be concentrated at the portion close to the mold. Under the consideration of simplicity and shorter testing time, it is recommended that the mold be at room temperature for the plant stability test.

Almost every stability test has its own method for compacting the specimen. The general principle in preparing a specimen is to simulate the actual compaction of a bituminous pavement. Since the orientation of the particles is an important element related to efficiency of compaction, density alone does not tell the whole story. For example: two specimens prepared by different types of compaction might have equal densities, but their resistance to deformation might not be the same. The general belief is that specimens prepared by static load alone cannot represent the condition in a bituminous pavement, although compaction by this means is still widely used in the preparation of specimens. This is because of its relative simplicity and the elimination of the personal equation which is often involved in other methods of compaction.

Test Factors Considered

In choosing the type of compactive effort for the plant stability test, consideration was given to two factors, namely: simulation of pavement condition, and simplicity in operation. It is tentatively specified that 50 blows with a 10-lb. hammer be applied by dropping it from a height of 18-in. followed by 1000 psi. static load maintained for 1 min. The rate of hammer dropping is approximately once per second. In several correlative experiments, it was found that specimens prepared by this compactive effort had a density a little higher than that of an asphaltic concrete pavement made of the same mixture right after compaction. Since the traffic will, to a certain extent, increase the density of the newly constructed asphaltic concrete mat, specimens of higher density are considered desirable. On the other hand, more investigations regarding the uniformity of density of specimen and more correlative studies will be made in order to assure a proper compactive effort for the preparation of specimen.

Specific gravity of the specimen is usually determined by a water displacement method. For the plant stability test, this method cannot be applied, because the specimen is not extruded from the mold after molding. As the height of specimen can be measured and the cross sectional area is constant, it is simple to compute the density from its weight and volume. When other factors are held constant, the density of a specimen is a good indication of the quality of mixture. Therefore, it is advisable to have this additional information.

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(*Continued on page* 88)

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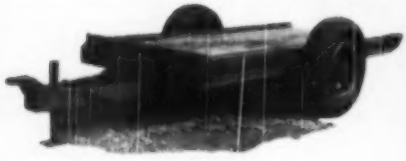

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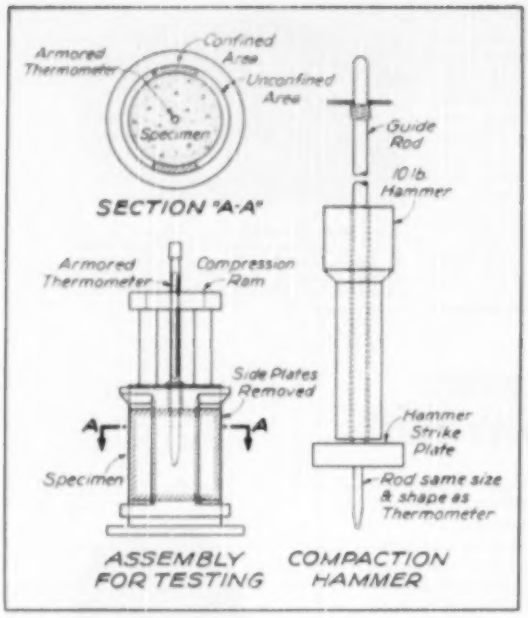
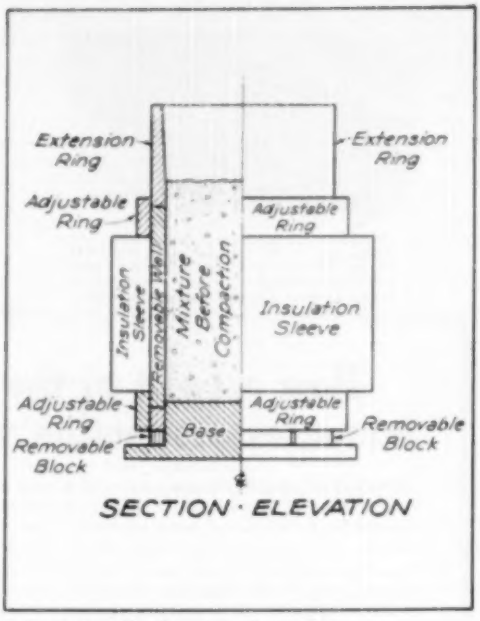


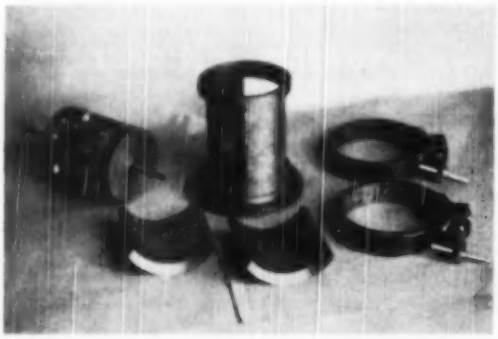
★ Fig. 1. Test apparatus and compaction hammer



★ Fig. 2. Assembly of apparatus for molding

(*Continued from page 86*)

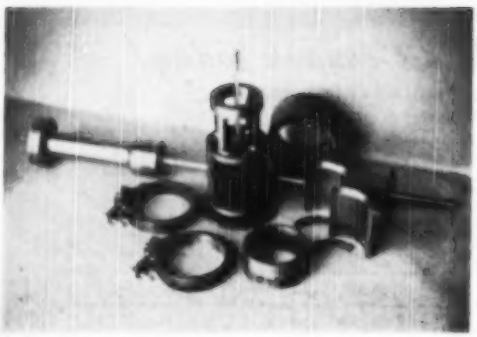
test conditions, measurement of temperature at the time of testing is a very important step in developing the plant stability test. Operation of this test would be as slow as of others if the use of constant temperature oven or water bath is not eliminated. The solution is to use an armored thermometer inserted in the center of the specimen to give a definite indication of the temperature of the compacted mixture at the time of testing. This thermometer method cannot be reliable unless the temperature difference between the center and outside portion of the specimen follows a definite pattern.



★ Fig. 3. Disassembled test mold

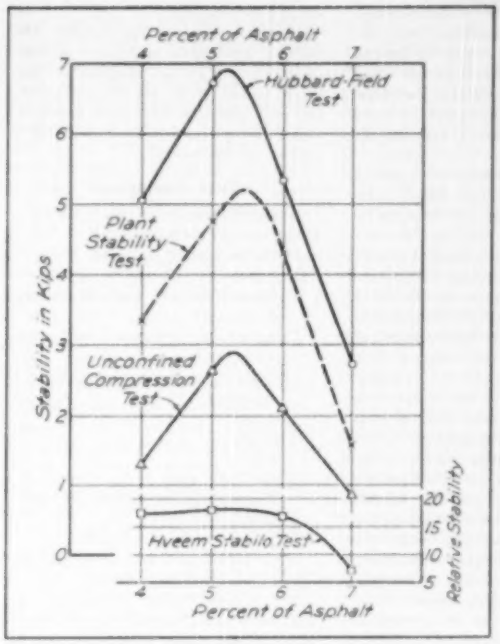
When a hot mixture is placed in a cool mold, the temperature of the mixture will gradually drop. In this case, the flow of heat is at an unsteady rate. Primary factors affecting such heat flow can be listed as follows:

(1) Thermal character (specific heat and thermal conductivity) of the

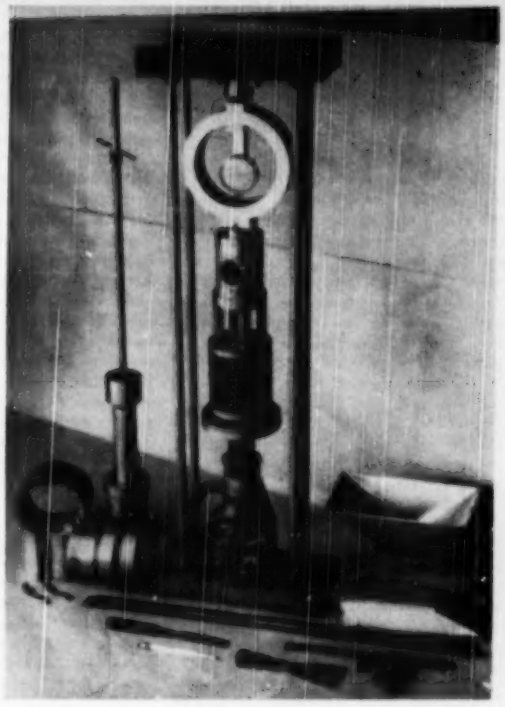


★ Fig. 5. Arrangement of apparatus before molding

★ Fig. 6. Specimen ready for testing



★ Fig. 4. Typical stability curves for various tests



★ Fig. 7. (Opposite): Complete equipment for stability test

mixture and the mold

(2) Temperature of the mixture and the mold

(3) Time of flow

(4) Dimensions of the specimen and the mold

(5) Condition of the surrounding air such as temperature and wind.

It is obvious that the thermal character of the mold and the dimensional factors are always constant. In order to minimize the influence due to air temperature and wind velocity, a 1-in. insulating sleeve is used to cover the mold (Figs. 1 and 5). The temperature of the mixture just before molding can be specified. On the other hand, it is sufficient to specify that the mold must be at room temperature, because effects due to variation in room temperature have been found to be negligible. In short, among all the factors influencing the flow of heat, there are two variables only,

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1950

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1900 (About)

the thermal character of the mixture and the time of flow. Since we are interested chiefly in the temperature of the outside portion of the specimen corresponding to a definite temperature at the center, no particular attention has to be paid to the time of flow.

Experiments were performed with various mixtures in order to measure the temperature difference between the center and outside portions of the specimen. Temperature was measured by thermo-couples inserted in the specimen before compaction. It was found that the temperature difference between the center and outside portion of a specimen followed a definite pattern. The effect due to variation in the quality of mixture as it may occur at a mixing plant is negligible. Therefore, it is considered that this thermometer method gives a sufficient measure of temperature for a field stability test.

Arrangements for inserting the armored thermometer are shown in Figs. 2 and 6. A rod, 2.5 in. long, is attached to the bottom of the hammer strike plate in order to reserve a hole for the armored thermometer which is connected with the compression ram. This rod has exactly the same shape as that of the lower section of the armored thermometer. Temperature for testing is 160 deg. F. as indicated by the inserted thermometer. This temperature was selected because tests using thermometer controlled specimens at this temperature gave approximately the same stability value as that found in tests using specimens heated to 140 deg. F. in a water bath.

By using the thermometer method as described above, it is possible to run a test (from time of molding to the end of testing) within 10 min. One point to be considered in such a rapid test is the setting of hot asphalt cement contained in the mixture. It is necessary to investigate whether the time interval between molding and testing of the specimen will have any effect on the stability and flow characteristics. Since, for cold mixtures, this time interval will certainly cause an appreciable difference, a definite curing period is always allowed for the specimen before testing. However, in the case of hot mixtures, effects due to the curing of the specimen are usually negligible. While more experiments are being made to check the validity of the suggested method of testing, reports from other investigators can be quoted on this point. After making a series of tests with hot asphaltic concrete mixtures, the U. S. Waterways Experiment Station (°) arrived at the following conclusion:

It was found that the stability and flow of specimens were not affected by the curing period. Specimens which were tested with no curing period showed stability and flow equal to those which had been cured for a period of 24 hours.

Test Equipment

Apparatus used for the Plant Stability test is as follows:

- Portable testing machine
- Complete set of test molds
- Compression ram with thermometer
- Compaction hammer and accessories
- Insulated weighing pan and thermometer
- Funnel
- Spatula
- Trowel
- Ruler (or dial with stand) for measuring the height of specimen
- Balance sensitive to grams
- Two pails, one for sampling, the other filled with water

All of these items, except the balance and pails, are shown in Fig. 7. Most of the items were built for the first trial in verifying whether the suggested testing device can be con-

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veniently applied at hot-mix asphaltic concrete plants. If the test is applied for routine plant control, certain improvements can be made. For example, the journal jack used in the portable testing machine should be replaced by a gear box in order to make a more compact machine and to obtain better control of the speed of testing. It is planned to construct an improved set of equipment after further investigations of the test are completed. The test mold and accessories now in use will be described to present a more definite idea of the operation of the plant stability test.

All parts of the mold are shown in Figures 1, 2, 5 and 6. Before molding, the extension ring and two removable walls are attached to the mold by two 1-in.-wide adjustable steel rings. Between these rings, an insulation sleeve is used to cover the entire mold. There are two curved blocks which can be placed directly under the wall of the mold. They must be removed after the specimen has received 10 blows from the hammer so that a double-plunger action will exist during further compaction. The extension ring, insulation sleeve, adjustable rings, and removable walls will be detached from the mold before testing.

Test Procedures

It is advisable to furnish two sets of molds at the plant laboratory. When one set is still warm after testing, the other set can be used. This does not mean that the plant stability test has to be performed continuously. Conditions at the plant will determine how often the test should be made. If the materials and plant operation are under normal condition, once every two hours is believed to be sufficient. On the other hand, continuous testing is desirable right after the change in mix-formula.

Before molding, a proper quantity of the sample mixture should be weighed out in the insulated weighing pan. The weight of mixture required to prepare a specimen can be estimated from results of previous tests. Usually it is approximately 1850 g. The pan should be covered with a thick cardboard and a thermometer inserted through a hole in the board into the center of the mixture. As the temperature of output at hot-mix plants is usually between 280 F. and 300 F., the temperature of the mixture in the pan after weighing will not be much higher than 260 F. When the temperature indicated by the thermometer drops to 260 F., the molding operation should be started.

The mixture in the mold receives 50 blows from a 10-lb. hammer dropping from a height of 18 in. Then the compression ram together with an armored thermometer is placed over the specimen (the thermometer being inserted in the hole at the center of specimen) and a static pressure of 1000 psi. is applied for one minute. The combined height of specimen, compression ram, and base plate is measured to 0.01 in. When the temperature of the specimen as indicated by the inserted thermometer drops to 170 F., all attachments on the mold are removed and the specimen is ready for testing. The compressive load is applied when the thermometer reading drops to 160 F., speed of testing being 0.2 in. per minute. The maximum reading on the proving ring is recorded and its equivalent load in pounds is termed the stability of the mixture. Time from the beginning of molding to this stage is usually ten minutes.

Summary

After testing, the specimen together with the mold is weighed to the nearest gram and the density of mixture is computed. Since the temperature of the specimen is still high at this time, there is no difficulty in removing the specimen from the mold.

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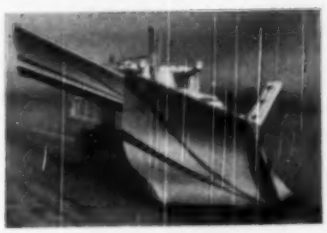

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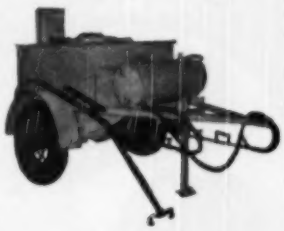

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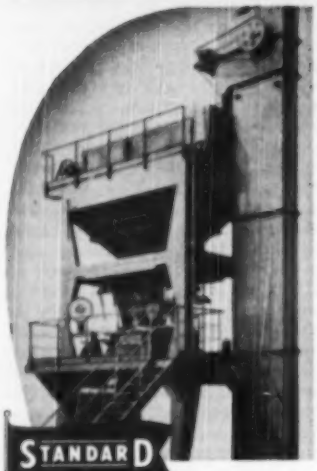

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The plant stability test is designed exclusively for the control of asphaltic concrete mixtures at hot-mix plants. Although investigations of various aspects of the test are still going on, there is enough background to believe that this test can help the inspector to get more effective plant control. Regarding the application of the plant stability test, it is necessary to discuss two points, the criterion for control and the reproducibility of results.

Criterion for the control of asphaltic concrete mixtures can be specified in two ways. First, the required stability may be stated as a certain percentage of the stability for the designed mixture. For example, one may specify that when the actual stability value is below 90 percent of the designed value, a proper adjustment for the mix-formula has to be made. Stability for the designed mixture can be found by making the test with a laboratory prepared mixture. Another way to establish the criterion is to specify a certain range for the stability value. This range has to be found from a great number of correlative experiments in order to compare the stability value of various mixtures with the service behavior of the corresponding pavement. Such extensive correlations may take years of time before final conclusions can be stated. One possible short cut is to correlate the plant stability test with other stability tests so that the crieria for other tests can be converted. Since different tests have different sensitivity to elements contributing to stability of mixture, such correlation between tests may be very difficult.

Asphaltic concrete mixtures are heterogeneous in character and, consequently, testing results cannot be as uniform as those for homogeneous mixtures. The larger the size of aggregate contained in the mixture, the greater will be the variation in testing results. For the suggested test, it was found that results were reproducible for mixtures using 1-in. or smaller aggregates. For mixtures using larger aggregates, a mold of larger size will probably meet the requirement related to reproducibility of results.

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Meetings Ahead

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS, Annual Convention—McAllister and Columbus Hotels, Miami, Fla.; Dec. 4-7.

HIGHWAY RESEARCH BOARD, Annual Meeting—Washington, D. C., January 8-12.

CALIFORNIA CONFERENCE ON STREET AND HIGHWAY PROBLEMS, held by Institute of Transportation and Traffic Engineering, University of California—Campus at Berkeley, Calif.; Jan. 24-26.

ASSOCIATED EQUIPMENT DISTRIBUTORS, INC., Annual Convention—Stevens Hotel, Chicago; Jan. 28-Feb. 1.

AMERICAN CONCRETE INSTITUTE, Annual Meeting—St. Francis Hotel, San Francisco; Feb. 20-24.

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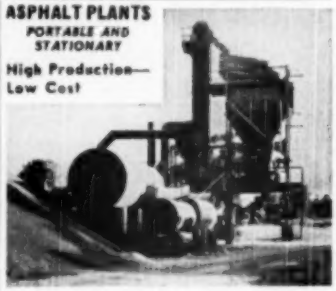


THE McCARTER IRON WORKS, INC.
NORRISTOWN, PENNA.

NEW EQUIPMENT AND MATERIALS

New and Improved Construction Projects

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 100. Each item is numbered. Just circle the corresponding number on the card and mail.

1

12 New 6-Wheel Trucks

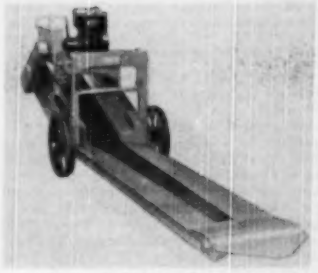
Twelve new 6-wheel truck models introduced by the Motor Truck Division of International Harvester Co., Chicago, Ill., feature many important engineering and structural innovations. There models, elements of International's recently introduced L-line, were built specifically to meet a wide variety of needs. The new 6-wheel models are the LF-170, gross vehicle weight 22,000 lbs.; the LF-171, GVW 24,000 lbs.; the LF-172, GVW 26,400 lbs.; the LF-174, GVW 28,000 lbs.; the LF-190, GVW 30,000 lbs.; the LF-191, GVW 32,500 lbs.; the LF-192, GVW 35,000 lbs.; the LF-194, GVW 38,000 lbs.; the LF-195, GVW 35,000 lbs.; the LF-210, GVW 37,000 lbs.; the LF-211, GVW 41,000 lbs.; and the LF-212, GVW 45,000 lbs. An outstanding feature of the International 6-wheel trucks is a new third differential mounted on the forward tandem axle. A single propeller shaft runs to the forward axle and from there, through the third differential, to the rear axle. This construction is stated to be an important improvement over the usual power divider and two separate propeller shafts. Powering the LF-170 series is the International Super Blue Diamond engine with full-pressure lubrication system. This engine develops 100.5 maximum brake horsepower at 3000 r.p.m. The Super Red Diamond engine powers the LF-190 and LF-210 series six-wheelers. The Super Red Diamond 406, standard engine for the LF-190 series models, develops 154 maximum brake horsepower at 3200 r.p.m. The Super Red Diamond 450, standard for models of the LF-210 series, develops 162 maximum brake horsepower at 2800 r.p.m.

Model LF-194 with 9-yd. Dump Body

2

Under-Car Unloader

A new combination belt and positive chain drive hopper bottom car unloader for handling aggregates has been introduced by George Haiss Mfg. Co., Inc., division of Pettibone Mulliken Corp., New York. Capacity of the machine is stated to be up to 3 tons per minute.



Unloader for Hopper Bottom Cars.

3

Disconnecting Hydraulic Coupling

A new unit, the Model HUD disconnecting hydraulic coupling (patent pending), announced by Twin Disc Co., Racine, Wis., is a new type of hydraulic drive which "dumps" the hydraulic fluid when desired to serve as its own master clutch and provide a complete disconnect between the prime mover and the load. With the exception of provisions for the disconnecting feature, the new unit is similar to other Twin Disc double-circuit hydraulic couplings in both design and operating characteristics. The new coupling is said to save weight and space commonly devoted to a master clutch and to pro-

LIGHTER

STRONGER

WELLMAN

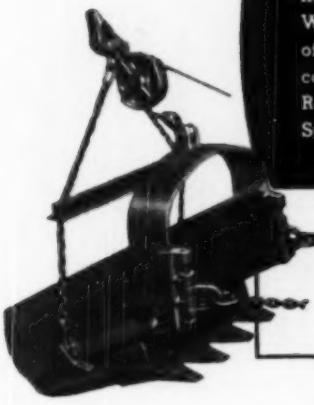
Williams Type BUCKETS

Stronger because they're constructed of **welded rolled steel** . . . *lighter* because non-essential weight has been eliminated. Wellman buckets meet every requirement of heavy service with longer life and lower cost! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service. ⅜ to 16½ yd. capacity.

SEND FOR BULLETIN

THE WELLMAN ENGINEERING COMPANY

7003 CENTRAL AVENUE CLEVELAND 4, OHIO

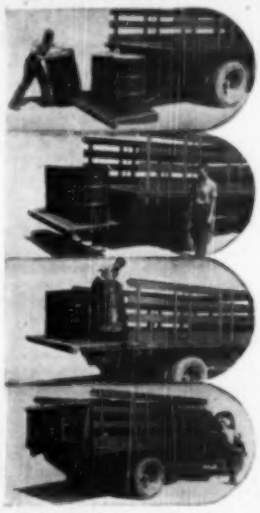


Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 100. Each item is numbered. Just circle the corresponding number on the card and mail.

vide all the other advantages of a hydraulic drive, such as smooth pick-up of the load, protection against stalling, and absorption of sudden shocks and overloads. The disconnecting coupling is expected to be of special advantage in excavating and hoisting equipment, in logging yarders and loaders; in oil field drawworks, slush pumps and engine compound drives. The new Model HUD Disconnecting Coupling is available in 21 in. and 27 in. sizes, with other smaller sizes to follow.

4
Hydraulic Lift End Gate

A combination hydraulic lift end gate for trucks hauling heavy or bulky cargo, brought out by The Perfection Steel Body Co., Galion, O., can be installed on any make or model truck with suitable body type. It is operated from the truck power take-off. It is claimed that by the use of this end gate, one man can load and unload heavy cargo in but a fraction of the man-hours ordinarily required by two or more men using manual methods; it also helps to reduce employee injuries and cargo damage in loading and unloading operations. Not only the lifting but also the closing of the gate is accomplished by hydraulic power. One of the most important features of the unit is the use of only one hydraulic cylinder for all operations connected with the lowering, raising, and closing of the gate.



Cobey Hydra-Power End Gate

5
Portable Blinker Light

A new barricade and warning light with several novel features has been announced by Hi-Way Specialties Co., Chicago, Ill. It is called the "Hi-Way Portable Blink-Lite." It consists of a powerful red blinker, visible in brilliant sunlight, mounted on a collapsible stand which can be spiked into the pavement or ground. A weather-proof box contains a two-volt 32 amp. battery with self-contained charging device. A six-volt DC motor with cam controls the flash. 80 to 100 hours operation claimed before recharging. Unit is designed for road and street departments, police and fire use and other purposes.

"Hi-Way Portable Blink-Lite"

With the profitable combination shown above you can recover valuable, saleable sand that may now be going "down the drain." Dakota Sand & Gravel Co., Bismarck, N. D., uses an Eagle Water Scalping Tank to concentrate water borne sand and an Eagle Double Screw Long Weir Washer-Classifier-Dehydrator to wash, classify and dewater sand.

At Dakota, gravel is conveyed to an elevated wet screen. Material passing the bottom deck of the screen flows into an Eagle Water Scalping Tank. Solids quickly precipitate and flow to the Eagle Screw Washer below, through adjustable gates on the bottom of the tank. The dirty water flows over a weir to waste. Design of the scalping tank is based upon long experience and experimentation — one of those "things that couldn't be done." The water heavily charged with sand which is deposited in the screw unit is quickly processed — the wash water flowing over the adjustable long weir at the lower end of the tub and the sand carried to the discharge at upper end of tub. The sand comes out clean and dewatered, and fed to conveyor belt stockpiler. Fines can be retained by raising weir on tub to increase head and reduce velocity — adjustable weir length flows off more or less fines. Many sand and gravel producers are now profiting from this combination.

Send for literature — Washer Cat. 47, Scalping Tank Bulletin 150.

Investigate the Eagle "Swintek" Dredging Ladder — agitates bonded material, screens nozzle against boulders, carries over-size out of pumping zone. Catalog 745.

SINCE 1872 Progress Service

"SWINTEK" DREDGE LADDERS—SCREW WASHERS
LOG WASHERS—DEHYDRATORS—SAND TANKS
CLASSIFIERS—REVOLVING SCREENS

EAGLE IRON WORKS
179 HOLCOMB AVE., DES MOINES, IOWA

6

Traffic Line Marker

A new self-propelled traffic line marker announced by The Gledhill Road Machinery Co., Galion, O., is a tractor-mounted, two-man operated machine, marking stripes 3 in. to 8 in. in solid or broken patterns. The machine is equipped with standard nationally known paint guns, tanks, valves, gauges and air compressor. Patented adjustable bead

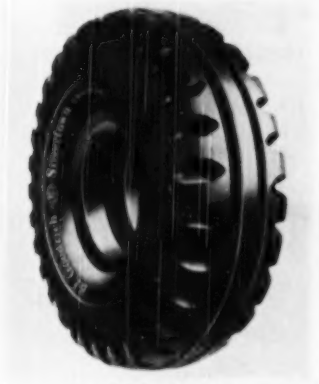
Gledhill Traffic Line Marker

dispensers give uniform distribution. Specially designed paint guards control the width of the traffic line and, being suspended, insure clean line edges and uniform paint distribution. The overall width of this machine is 5 ft. 6 in. This permits traffic to pass on either side without interruption. The tractor is equipped with a governor which insures constant speed at all times and under all road conditions.

7

Off-the-Road Tire

A new off-the-road tire in its Universal line, especially designed for front wheels where easier steering is desired, has been announced by The B.F. Goodrich Co., Akron, O. The ribbed tread has been especially engineered for this purpose, and construction of the tire is the same as the conventional Universal. The tire is available in three popular sizes, 12.00-24, 16 ply rating; 13.00-24, 18 ply rating and 14.00-24, 20 ply rating.



New Off-Goodrich Tire

8

Hydraulic Brake Adjusting Tool

A new tool for adjusting Wagner hydraulic brakes on late model International trucks, announced by Owatonna Tool Co., 425 North Cedar St., Owatonna, Minn., is stated to be a necessity in any shop servicing International trucks. It is designed for time saving work on brakes FR, FR25 and FR25D and is built to withstand hard use.

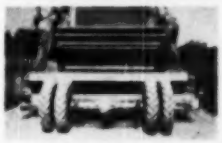
New OTC Adjusting Tool

9

Shop Maintenance Unit

A new Shopsmith maintenance unit announced by Magna Engineering Corporation, San Francisco, Calif., in only 18 by 60 in. of floor space, provides a power unit which can be converted into an 8-in. circular saw with extension table, 15-in. vertical drill press, 33-in. lathe, 12-in. disc sander, or horizontal drill press. The horizontal drill press, shown above, is a new power tool for jobs such as doweling, drilling in the ends of long workpieces, and other jobs that are difficult or

Hercules Cement Spreader outperforms all others—*at any price!*



A TWO MAN TEAM—plus the Hercules—makes up your complete spreading crew; you save from 2c to 5c per square yard in time, labor, and materials!

You'll complete your soil-cement contracts ahead of schedule . . . cut labor costs . . . get even spreading without waste with the amazing Hercules Cement Spreader. Just couple it to any conventional dump truck and you're ready to spread any amounts of cement needed up to ten foot widths—all at a single pass. Ruggedly built, easy to operate, mechanically fool-proof, the Hercules Cement Spreader offers you a real profit opportunity in the soil cement field. Send coupon below for complete information.

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ACKER SOIL SAMPLING KIT

GIVES YOU 12 DIFFERENT EARTH AND SOIL SAMPLING TOOLS!

Here, in a compact, easy-to-carry kit (it fits into any automobile), are an even dozen tools for recovering accurate samples from practically any material except bed rock.

ITS MANY USES

Airfield runways • Aluminum silicate deposits Brick making materials • Foundation test borings Gold bearing sands • Clay Marl • Clay and kaolin for ceramics • Sand and gravel pits • Moisture content previous to soil compaction • Subgrade testing for highways • Base materials for soil cement stabilization Soil density for bearing data • sewer lines • etc.

We invite you to write us today for Bulletin 26-8S. There are great savings when you use this 12-tool sampling kit, so don't delay.

ACKER DRILL COMPANY, INC. SCRANTON 3 PENNSYLVANIA

ELECTRIC WHEELS

Designed to do the Job

Wheels and Axles are our business, and our engineers are well qualified to recommend the most efficient assembly for your product.

Our factory is modern and tooled for low cost production. We have supplied manufacturers in many different industries for more than 50 years.

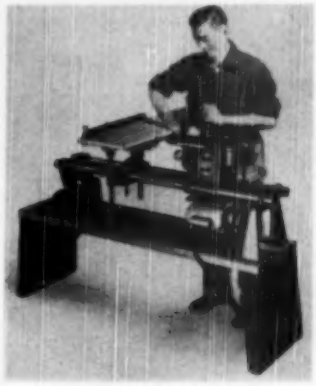
Standard or Special, ELECTRIC Spoke-type or Disc Wheels are built for most types of portable equipment.

Send us your specifications and we will submit our recommendations.

ELECTRIC WHEEL CO., 2912 Pine, Quincy, Ill.

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 100. Each item is numbered. Just circle the corresponding number on the card and mail.

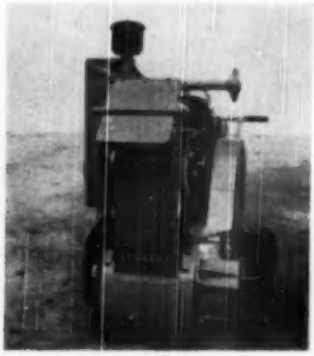
impossible on a vertical drill press. Accessories can be added to convert Shopsmith into a jointer, shaper, drum sander, mortiser, jigsaw, and other power tools.



Horizontal Drill Press

10 Joint-Cleaning Devices

To speed up joint-cleaning in preparation for resealing G. H. Tennant Co., 2578A North 2nd St., Minneapolis 11, Minn., has developed three new devices —accessories for its Model G joint-cleaning and grooving machine. They can be attached in the field on any present model and are available for immediate delivery. More accurate control of cutter bite is provided by a new adjustable third wheel. It raises or lowers the cutting head to allow fast, uniform removal of old seal and debris from joints, cutting to exactly the desired depth without need for special skill on the part of the machine operator. A second accessory solves tire-gumming problems in hot weather. It is a tire-moistening device, complete with 4-gal. tank, valves and feed pipes. So the Tennant machine can easily be towed from job to job, a ⅝ in. steel towing frame has been introduced. It can be attached in 2 minutes.



Tennant Machine with New Accessories

are you ready for fall and winter asphalt repairing and patch-work?

make sure!

use ***DARAKOTE***
anti-stripping additive

Use ***DARAKOTE*** and you can continue cold-patch and repair work right through the late Fall . . . despite cold, wet weather.

With ***DARAKOTE,*** you can coat cold, wet aggregates with cut-backs and road oils . . . . and your patches stay put. ***DARAKOTE*** actually displaces water, permanently binds asphalt to the aggregate, prevents stripping even during heavy rains.

DARAKOTE retains its effectiveness under heat, will not settle out in storage. ***DARAKOTE*** is more effective at all working temperatures.

DARAKOTE *AT WORK*

Asphalt paving plant of Essex Sand & Gravel Co., West Peabody, Mass., preparing ***DARAKOTE*** *plant-mix for resurfacing section of Route No. 28, Andover, Mass.*

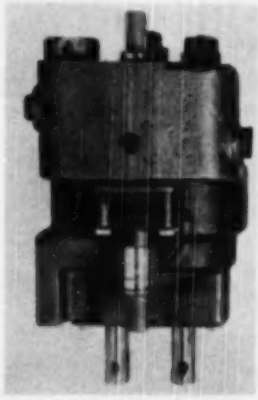
Dewey and Almy Chemical Company

Cambridge 40, Mass. *Chicago 38*
San Leandro, Calif. *Montreal 32*

11

Hydraulic Pump-Valve Unit

A new oil hydraulic pump-valve combination unit, placed on the market by The Commercial Shearing & Stamping Co., Youngstown, O., is made in three



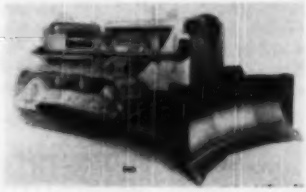
B101 Series Pump Valve Unit.

sizes, 1½ in., 2 in. and 2½ in. and can be furnished without relief valve or with single stage or two stage relief valve. Included in this unit is an easy push pull action balanced spool control valve having raise, hold and lowering positions. These pumps are designed for use in actuating dump units and recommended for intermittent use with operating pressure up to 1500 p.s.i. Two drive shafts are provided for connection to power take off shaft having either rotation.

12

U-Shaped Bulldozer

A new, large capacity, U-shaped bulldozer, added to the heavy earthmoving equipment line of Caterpillar Tractor Co., Peoria, Ill., is designed for universal use in a variety of earthmoving applications with the Caterpillar diesel D8 track-type tractor. Designated as the No. 8U, the new bulldozer is similar to the standard Caterpillar 8S bulldozer except for the U-shaped blade which necessitates longer push arms. The complete unit is cable-controlled and consists of blade, push arms, trunnions, cable, sheaves, and sheave brackets. Cutting width of the blade is 11 ft., 11 in., and it is 45⅝ in. high. Maximum lift above ground at the center point of the blade is 47½ in., and 54⅝ in. at the end points. The limit of blade pitch adjustment is 10 degrees, and the maximum blade tilting adjustment is 16 in.



No. 8U Bulldozer

4 days' work in 3 with JAEGER AIR

Jaeger Model 250 holds full pressure behind 2 heavy rock drills . . . averages 35% more daily footage than with any 210 ft. compressor.

Other Jaeger "new standard" ratings give you comparable increases in production as shown below.

Model 75 runs a heavy breaker or shooting driver, 2 clay spades or 3 tampers at full pressure. No 60 ft. can do this.

Model 125 runs 2 heavy breakers at full pressure. No 105 ft. can do this.

Model 185 runs 3 heavy breakers or 2 medium rock drills at full pressure. No 160 ft. can do this.

Model 365 runs a heavy duty wagon drill, plus a rock drill or heavy breaker at full pressure. No 315 ft. can do this.

Model 600 runs 2 heavy duty wagon drills at full pressure, which no 500 ft. can do, and has air to spare for auxiliary drilling.

If 30% to 40% more production with the same men and tools sounds interesting, see your Jaeger distributor—or ask us for Catalog JC-8.

See your Jaeger distributor or write

THE JAEGER MACHINE CO.

223 Dublin Avenue Columbus 16, Ohio

PUMPS • MIXERS • HOISTS • TOWERS
TRUCK MIXERS • PAVING MACHINERY

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 100. Each item is numbered. Just circle the corresponding number on the card and mail.

13

Backfill Blade Attachment

A new backfill blade attachment, announced by Schield Bantam Co., Waverly, Ia., is claimed to greatly speed covering and leveling of all types of excavations and trench work. Designed for fast, interchangeable operation with the ⅜ yd. truck-mounted Schield Bantam trench hoe, the new backfiller consists of a cable-operated steel blade mounted on a wishbone dip stick, with two tubular control arms, which hold the blade vertical to the ground as it is pulled toward machine. The manufacturer claims this exclusive "dozer action", plus exceptionally fast mechanical controls, enables the Bantam blade to "roll" big loads of dirt into a trench much faster and easier than old scoop-type backfillers. Equipped with heavy-duty 24 in. x 60 in. blade with ½ in. reversible cutting edge, the attachment has a maximum reach of 23 ft. 6 in. in any direction, plus ability to work to within 6 ft. 6 in. of the center of machine rotation. It can also be controlled vertically to within 1 in. of the ground surface.

Schield Bantam with Backfill Attachment

14

Logging Arch

An improved logging arch, available for use with "Caterpillar" D7 and D8 track-type tractors, has been announced

Hyster 78 Logging Arch

by Hyster Co., Portland 8, Ore. The new arch has been materially reduced in weight as compared to the older model while retaining the same rugged construction and balanced characteristics of the preceding design. This new design permits the arch to operate behind larger tractors with higher horsepower when additional pull is required. The reduction in weight also steps up the speed and frequency of return trips over rougher, steeper slopes with resulting higher production for the operator at lower costs.

15

Maintenance Distributor

A new maintenance distributor, Model RHU in 600, 800 and 1,000 gal. capacities, has been added to the line of Rosco Manufacturing Co., 3118 Snelling Ave., Minneapolis 6, Minn. Designed for mounting on trucks of 1½ capacity or more, the new model is a general purpose unit for handling all types of bituminous materials, Model RHU is standard equipped with quick-detachable, non-folding stationary spraybar in lengths governed by pump capacity. Burners, power unit, including a 100 GPM rotary pump, are all compactly mounted at the rear. All operating control levers are conveniently located.

Model RHU Distributor

ALL ROAD AND AIRPORT ENGINEERS IN CHARGE OF SNOW REMOVAL SHOULD KNOW THESE FACTS ABOUT

THE FRINK MULTI-FEATURE SNO-PLOW

You'll save yourself many snow removal headaches with the Frink Multi-Feature Sno-Plow. They're made to be used against the roughest snow conditions . . . to do the job faster and with more efficiency than the ordinary snow plow.

Every Frink Sno-Plow is backed by over twenty years of experience. Twenty years of careful engineering. You can't beat experience and everyone who knows snow plows knows you can't beat the Frink.

Frink Sno-Plows are being used by street departments and airports across the country.

For Further Information Write Box R505, Clayton, New York

FRINK SNO-PLOWS

FRINK SNO-PLOWS, INC., CLAYTON, NEW YORK
DAVENPORT-BESLER CORP., DAVENPORT, IOWA
FRINK SNO-PLOWS of CANADA, LTD., TORONTO, ONT.

16

Unit Batch Plant

A new unit batch plant, stated to incorporate numerous combinations and applications, has been announced by Gar-Bro Manufacturing Co., 2416 E. 16th St., Los Angeles, Calif. The units, built

Gar-Bro Unit Batch Plant

in a capacity to handle the charging of 1 yd. mixers or smaller, come in single or dual aggregate units which may be hooked up in series with a bulk cement bin unit and with an auxiliary cement silo if additional storage is required. Upon the completion of a particular job the units may be rearranged to meet other conditions. A weigh hopper, mounted on a double rail track, travels from bin to bin without interruption and may be set to dump from either side or either end.

17

Multi-Purpose Utility Drill

A new, lightweight utility drill, announced by Gardner-Denver Co., Quincy, Ill., comes in a handy carrying case with a complete kit of drill accessories, including a 14-in. drill steel and three as-

S17 Utility Drill and Carrying Case

sorted-size rock bits, a star drill adapter and 25 ft. of air hose. This Gardner-Denver S17 is a full-fledged, self-rotating pneumatic hammer drill that weighs only 19 lb. According to reports, it's a handy tool for placing anchor bolts, for running conduit, cable, pipe, and for many other jobs. It will drill either concrete, brick or stone with standard drill steel, and a star drill adapter furnished with the drill accommodates standard star drills. A special stop-rotation feature converts the S17 to a lightweight chipping hammer or pick.

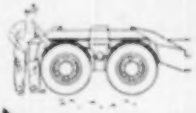
18

Newly Developed Porto Pump

Radical changes and developments have been made in the Porto pump of Porto Pump, Inc., 227 Iron St., Detroit

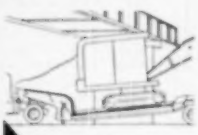
(Continued on page 101)

MAKE YOUR NEXT TRAILER

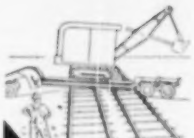


THE *Distinctively* DIFFERENT
ROGERS POWER LIFT
Demountable Gooseneck Trailer

1 Carries heavier loads faster and more profitably on larger tires.



2 Stoops to clear low overhead obstructions.



3 Raises its deck to clear high banked crossings.

4 Detaches quickly for fast, easy front loading.

YOUR trailer can be merely a heavy vehicle or a versatile money-making machine like this new Rogers unit.

It will haul heavier loads, with less elapsed time under the varying road conditions encountered than any trailer heretofore available.

The driver, using the truck winch, can detach the gooseneck, load or unload equipment, and reattach it in about 5 minutes. He can raise or lower the front of the deck as explained; or he can quickly load non-powered or disabled equipment with remarkable speed.

Get the information about this revolutionary trailer before buying any new equipment.

ROGERS TRAILERS
EXPERIENCE builds 'em PERFORMANCE sells 'em
ROGERS BROTHERS CORPORATION, 110 Orchard St., ALBION, PA.
Export Office: 30 Church St., N. Y. 7, N. Y. • Cable Address: "Broschar"

More Yardage with Less Labor

Sauerman Slackline builds cofferdam across gorge on river.

Sauerman Scraper digs volcanic ash from hill and loads into cars.

How Sauerman Machines Cut Costs

With one man at the controls a Sauerman Scraper or Slackline Cableway can reach out 1,000 ft. or more and dig, haul and dump sand, gravel or any bulk material. Simple operation! Economical use of power!

A Sauerman machine can be installed to reach across a pit, pond, river or stockpile, or up to the top of a hill. It moves material rapidly anywhere within its wide radius. Flexible for any ground conditions. Costs only a few cents per cubic yard handled. Gas, electric or diesel.

Rope Haulage Equipment Specialists Since 1909

Write for new Sauerman Catalogs

SAUERMAN BROS., Inc.

588 S. CLINTON ST. CHICAGO 7, ILLINOIS

Quick Help on Product Information

1. For latest information on any product you need in roadbuilding, earth moving heavy construction, etc., use business-reply card inserted in this publication. Just fill in our code numbers on blank lines of Part "C" of the postcard, fill in name, address, etc., tear out, and mail.

2. For information on particular products advertised in this issue, use Part "A" of the bound-in cards.

3. Part "B" of the cards is also usable for further information on any items described in the "New Equipment and Materials" or "Manufacturers Literature" sections of the magazine.

A

7201 Acetylene Gas
2001 Additives, Bituminous
6201 Air Cleaners
1001 Air Compressors
1002 Air Comp., Self-Propelled
1003 Air Tool Accessories
3302 Arches, Corrugated Metal
2008 AsphaR, Emulsion
2004 Asphalt, Liquid
2005 Asphalt, Powdered
7002 Axles, Truck

B

6801 Backfillers
6004 Backfill Tampers
9014 Bars, Concrete Reinforcing (Accessories)
1401 Batchers, Aggregate
1402 Batchers, Cement
7801 Batchers, Water
8202 Batteries, Elec. Storage
4601 Beads, Glass Reflecting
7401 Bearings, Roller
8001 Belting, Conveyor
2004 Belts, Concrete-Finishing
2005 Benders, Bar
2006 Bins and Hoppers
1007 Bits, Drill: Sharpeners
1005 Bits, Rock Drill
1402 Bitum. Hot Patch Units
2201 Blades, Grader, Loader and Scraper
5601 Blades, Toothed (Ice Removal)
9401 Block and Tackle
9401 Block Machines, Concrete
9203 Boat Spikes & Drift Pins
7001 Bodies, Agitating
7003 Bodies, Dump
7004 Bodies, Flatbed
7005 Bodies, Garbage Col.
7006 Bodies, Pick-up
7602 Booms, Special
1203 Breakers, Impact
1006 Breakers, Pavement
2807 Bridges, Float
3204 Bridges, Suspension
1806 Brooms, Drag
1807 Brooms, Road
2401 Buckets, Cableway
2402 Buckets, Clamshell
2403 Buckets, Clamshell (Hydraulic)
2404 Buckets, Concrete
2405 Buckets, Dragline
2406 Buckets, Dredge
2808 Buggies and Carts, Conc.
7604 Buildings, Demountable
6405 Bulldozers
6401 Bulldozers, Angling
6404 Bulldozers for Motor Graders

C

7605 Cars, Industrial Railway
5801 Carts, Street-Cleaning
1204 Car Unloaders
2407 Castings and Parts, Manganese Steel
3001 Cement, Air-Entraining Portland
3002 Cement, Asphaltic
3002 Cement, Portland
3003 Cement, Quick-Setting Portland
3004 Cement, White
3205 Centering, Concrete Arch Form
3805 Center Strip Materials, Road
7401 Chain
1206 Chain, Conveyor
2811 Chutes, Concrete and Dry Material
6406 Clearing Equipment, Tractor-Mounted
3001 Cleaning Solvents
2602 Cleaners, Cement Bag
5201 Compactors, Soil
2603 Concrete Placers
3206 Connectors, Timber
3006 Contraction Plates
5405 Control Equip., Cable
4004 Control Equipment, Hydraulic
4812 Control Equipment, Tagline
1205 Conveyors, Belt
4802 Cranes, Crawler-Mounted
4803 Cranes, Hydraulic
6407 Cranes, Tractor-Mounted
4804 Cranes, Trailing, 2-Wheel
4805 Cranes, Truck-Mounted
4806 Cranes, Wheel-Mounted
6408 Crawler Tracks
3219 Cribbing, Retaining Wall
1207 Crushers, Jaw
1202 Crushers, Roll
3207 Culvert Cleaning Tools
3208 Culverts, Corrug. Metal
3209 Culverts, Sectional Plate
2004 Curing Machines, Concrete (Spray)
3007 Curing Materials, Concrete
2813 Cutters, Bar and Rod
4001 Cylinders, Hydraulic

D

3210 Decking, Bridge (Open and Solid)
7606 Derricks
2408 Dippers, Shovel
1802 Distributors, Bituminous
3008 Dowels and Assemblies
4807 Draglines, Walking
1215 Drags, Sand
5002 Dredges
1201 Driers, Aggregate
3401 Drills, Cable Tool (Well)
3402 Drills, Core
3405 Drills, Earth-Boring
3404 Drills, Electric Hammer
1009 Drills, Rock (Hand-Held)
1010 Drills, Rock (Tripod)
1011 Drills, Rock (Wagon)

E

1210 Elevators, Bucket
2814 Elevators, Cement (Bulk)
4602 Enamels, Equip. and Sign
6203 Engines, Diesel
6204 Engines, Distillate
6205 Engines, Gasoline
6602 Excavators, Slackline Cableway

F

1211 Feeders, Aggregate
2006 Felt, Subgrade (Elastic)
7402 Fencing, Wire
4201 Filing Systems
2605 Finegraders (Subgraders)
1809 Finishers (Pavers), Bituminous
2606 Finishers, Vibrating
2607 Finishing Machines, Concrete
7403 Fittings, Wire Rope
4401 Flares (Torches)
4005 Fluid, Hydraulic
5802 Flushers, Street
2007 Flux, Bituminous
2815 Forms, Catch Basin and Manhole (Concrete)
2815 Forms, Concrete Construction
2817 Forms, Curb, Road and Sidewalk (Concrete)
3603 Fuel, Diesel and Gasoline

G

3212 Gates, Drainage
1214 Generator Sets, Engine
1810 Generators, Steam
3801 Graders, Elevating
3303 Graders, Motor
3302 Graders, Pull-Type
3604 Graphite
2409 Grapples
3405 Grinders, Concrete-Surf.
1212 Grizzlies
3213 Guard Rails

H

7202 Hard-Facing Rods
1813 Heaters, Pavement-Surface
1814 Heaters, Tank Car (Bituminous)
1815 Heaters, Tool (Bitum.)
1816 Heaters, Torch
2819 Heaters, Water
7607 Hoists, Electric
4003 Hoists, Hand
4002 Hoists, Hydraulic (Body)
1012 Hoists, Pneumatic
4808 Hoists, Power Drum
6002 Hose, Air
6003 Hose, Cement-Handling
6004 Hose Couplings
6005 Hose, Metal (Flexible)
6006 Hose, Suction
6007 Hose, Water

J

4006 Jacks, Hydraulic
2608 Joint-Cleaning Machines
2609 Joint Installing Machines
3010 Joint Plates, Base (Waterproof)
2011 Joint-Sealing Compounds
3012 Joints, Pavement

K

1803 Kettles, Bituminous

L

4403 Lanterns
5803 Leaf-Collecting Machines
4404 Lights, Acetylene
4402 Lights, Flood
4405 Lights, Flood (for Equipment)
4406 Lights, Warning (for Equipment)
7608 Liner Plates, Tunnel
7609 Linings, Brake and Clutch
2202 Lips, Bucket
5402 Loaders, Belt
5401 Loaders, Bucket
5403 Loaders, Front-End
5404 Loaders, Truck-Mounted
3605 Lubricants
3606 Lubricants, Compressor and Air Tool
3607 Lubricants, Diesel Engine
3608 Lubricants, Grease and Oil (Engine)
3609 Lubricants, Wire Rope

M

4809 Magnets, Lifting
3805 Maintainers, Pull-Type
3804 Maintainers, Under-Tractor
3806 Maintainers, Under-Truck
7610 Melting Pots, Lead
1811 Mills, Grinding (Asphalt)
1817 Mixers, Bituminous
2610 Mixers, Concrete
2611 Mixers, Mortar and Plaster
3807 Mowers, Highway
2612 Mud Jacks

O

1013 Oilers, Air-Line Air-Tool

P

5003 Packing, Pump and Valve
4605 Paints, Priming
4603 Paints, Rust-Preventive
4604 Paint Sprayers and Compressors
4608 Paints, Traffic line
4606 Paints, Traffic Line Marking (Reflecting)
2613 Pavers, Concrete
3214 Pile Drivers
3216 Piling, Bridge and Found.
3215 Piling, Steel-Sheet
3211 Pipe, Drainage (Perf.)
5001 Pipe, Dredge
3217 Pipe-Joint Materials
2008 Planking, Asphalt
1818 Plants, Asphalt (Emulsified)
2802 Plants, Batching (Conc.)
2803 Plants, Batching (Low-Bin, Trolley-Type)
1604 Plants Bituminous (Portable)
1601 Plants, Bituminous (Stationary)
1603 Plants, Bitum. Travel
2809 Plants, Cement (Bulk; Portable)
2812 Plants, Concrete-Mixing (Portable)

(List continued on opposite page)

Quick Help on Product Information

2810 Plants, Concrete-Mixing (Stationary)
1208 Plants, Crushing and Screening (Portable)
1209 Plants, Crushing and Screening (Stationary)
5004 Power Plants, Portable
7008 Power Take-Offs, Truck
6206 Power Units
3218 Preservatives, Wood
3406 Presses, Crawler Track Pin
4801 Pull Shovels (Backhoes)
6403 Pull Shovels, Tractor-Mounted
6402 Pull Shovels, Trailing, 2-Wheel
1213 Pulverizers, Hammer
5005 Pumps, Bituminous
5014 Pumps, Centrifugal (Portable)
5006 Pumps, Centrifugal (Stationary)
5007 Pumps, Diaphragm
5008 Pumps, Displacement
5009 Pumps, Dredge
5010 Pumps, Gear
5011 Pumps, Grease and Oil
5012 Pumps, Hydraulic
5013 Pumps, Jetting
5015 Pumps, Rotary

R

3808 Rake Attachments for Graders
6008 Reels, Hose
2203 Rippers and Rooters
1014 Riveters and Chippers, Pneumatic
3201 Rods, Bridge Anchor
5206 Rollers, Drawn
1801 Rollers, Grid-Type
5202 Rollers, Pneumatic-Tired
5204 Rollers, Tandem
5203 Rollers, Sheepsfoot
5205 Rollers, 3-Wheel
5207 Rollers, Trench
2010 Rubber Road Materials
6207 Rust Preventives, Engine

S

2820 Salamanders
1804 Sandnls, Bitum. Paving
4607 Sand Blasters
3408 Saw Rigs
3407 Saws, Chain
1402 Scales, Weigh-Batcher
1403 Scales, Wheelbarrow
2204 Scarifiers
5407 Scrapers, Drawn
5406 Scrapers, Self-Propelled
2821 Screeds, Concrete
2614 Screeders, Vibrating
1216 Screens, Vibrating
3809 Scythes, Power
2410 Sheaves
4810 Shovels, Crawler-Mounted
6409 Shovels, Tractor-Mounted
7009 Shovels, Truck-Mounted
7611 Signs, Road
4811 Skimmers
2411 Skullcrackers
5602 Snow Fencing
5603 Snow Loaders
5604 Snow Plows, Blade and V-Type
5605 Snow Plows, Rotary
5606 Snow Plows, Rotary (for Motor Graders)
5607 Snow Plows, Sidewalk
5608 Snow Plow Wings
4202 Soil Sampling and Testing Sets
3208 Soil-Stabilizers
1805 Sprayers, Bituminous
2615 Spreaders, Concrete
1404 Spreaders, Dry Material
2412 Steel, Alloy
3015 Steel, Concrete-Reinforc.
1008 Steel, Drill
7404 Steel, Structural
4203 Surveying Instruments
5804 Sweepers, Street

T

7010 Tail Gates, Elevating
1819 Tanks, Relay and Storage (Bituminous)
7612 Tarpaulins
2009 Tar, Road
2205 Teeth, Bucket, Ripper, Scarifier, etc.
3016 Tie Rods
6009 Tires, Construction Equipment
6010 Tires, Truck
3409 Tool Carts
1812 Tools, Hand (Bituminous)
2818 Tools, Hand (Concrete)
3410 Tools, Mechanics' (Construction and Equip.)
2822 Towers, Material-Hoisting
7613 Track, Industrial-Railway
6208 Tractors, Crawler
6209 Tractors, Wheel
4609 Traffic Line Marking Machines
6603 Trailers, Flatbed
6604 Trailers, Tilting
6605 Tramways, Aerial
6802 Trenching Machines
2616 Truck Mixers
7011 Trucks, Highway
7007 Trucks, Industrial (Fork)
7012 Trucks, Off-the-Highway
7614 Tubing, Steel (Seamless)

U

3220 Underpasses, Pedestrian and Livestock

V

4007 Valves, Hydraulic
1015 Valves, Safety (Air-Line)
2617 Vibrators, Concrete

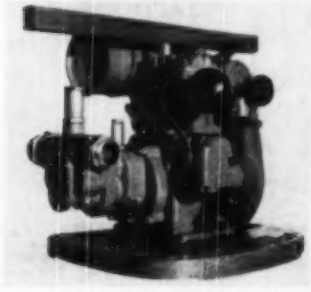
W

5408 Wagons, Dump
1217 Washers and Scrubbers, Aggregate
4610 Waterproofing Compounds
7203 Welding Apparatus
7204 Welding Rods
3411 Wheelbarrows, Power
2413 Wheels, Steel
3810 Wideners, Highway
4008 Winches
3017 Wire, Form and Tie
3009 Wire Mesh, Pavement
7405 Wire Rope

Additional facts on products described below can be obtained from the manufacturer via postcard inserted at page 100. Each item is numbered. Just circle the corresponding number on the card and mail.

(*Continued from page 99*)

7, Mich. While this rotary, positive displacement, rubber gear pump is especially applicable for pressure testing and chlorinating water mains, it also is excellent for cleaning dirty earth moving equipment and can be utilized efficiently for spraying and jetting. The pump is easily carried, simple to operate and dependable. It quickly develops pressures up to 200 lb. The pump has rubber gear construction, pre-lubricated bearings, mechanical seals (no packing) adjustable by-pass valve, and 4-cycle engine.



New Porto Pump

19

Canvas Housing for Tractors

A heavy canvas housing, Heat-Houser Industrial, announced by Fort Dodge Tent and Awning Co., Fort Dodge, Ia.,

Heat Houser Industrial Housing

is designed for both tractor and operator protection during cold weather. It is a compact one-piece heavy-duty housing. It permits operator freedom and does not interfere with most mounted equipment. It is available for most models of industrial track type equipment.

20

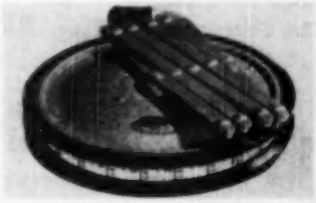
Carbide Drill

A new carbide drill for use in the Cleco Handi-Drill is now being produced by the Cleco Division of Reed Roller Bit Co., P. O. Box 2119 Houston, Tex. Sizes are ½ in. to 1 in., with lengths of 6 in., 12 in. and 18 in. According to the manufacturer, the new drills when used with the Cleco Handi-Drill will penetrate concrete at the rate of 5 in. per minute and have been known to drill 500 holes without resharpening.

21

1-Man Tape

A new, lightweight rolatape, announced by Rolatape, Inc., 1415 14th St., Santa Monica, Calif., is claimed to permit safe and accurate measurements of from a few inches to almost unlimited lengths by a single individual. Recessed tape face on rim of wheel indicates measurement in fraction of inches up to 2 ft. Automatic counter clocks measurements in feet and in cycles of 100 ft. In operation, an audible click is made for every 2 ft. measured and a bell rings at the 100-foot mark. A lightweight handle collapses down to 8 in. when not in use so that complete unit can be carried in glove compartment of any automobile.



New Lightweight Rolatape

MANUFACTURERS' LITERATURE

22

Franchise for H-Bar Devices — Load Transfer Devices, Inc., 105 West Madison St., Chicago, Ill., has granted an exclusive franchise to Universal Form Clamp Co., for the manufacture and sale of "H-Bar" load transfer devices in the state of Illinois. Under this arrangement Universal Form Clamp Co., will manufacture and assemble complete joint structures in their plant at 1238 N. Kostner Ave., Chicago, Ill., for delivery to job site.

23

Drainage Structures

A 6-page folder issued by Armco Drainage & Metal Products, Inc., Middletown, O., describes the structural strength and material durability of Armco asbestos-bonded pipe to withstand severe conditions. It also describes how asbestos-bonded pipe is made. Photographs illustrate test installations and installations of industrial sewers and culverts in marshy and salt water conditions.

24

Negotiating Export Documents

An interesting booklet describing the entire line of Onan products available to the export market, issued by D. W. Onan & Sons, Inc., Minneapolis, Minn., contains a list of suggestions for negotiating export documents. These suggestions are the result of Onan's years of experience in the export market and will assist overseas importers in the preparation of such documents necessary in the import-export trade.

25

Hard-Facing

A new printing of its 48-page hard-facing guidebook has been issued by Stoody Co., Whittier, Calif. It is designed as a handbook for selecting the alloy producing greatest service life, considering such factors as initial cost and speed of application. The Stoody guidebook also provides a quick source of information as to the type and amount of rod for equipment commonly used, brief hints on the hard-surfacing procedures and explanatory drawings indicating proper placement of the hard metal deposits.

26

Truck Mixers

Current models of Hi-Up Worthington-Ransome truck mixers and agitators are described in a new bulletin announced by Worthington Pump and Machinery Corporation, Harrison, N. J. Specifications, line drawings and pictures are included in the 20 page bulletin, as well as pictures and explanations of such features as the main frame, transmission, clutches, trunnion bearings, chain drive, water system, water tank and the flush tank, drum head, drum rollers, drip ring, hopper, seal and clutches. Manufacturing techniques are also discussed.

27

Maintenance of Business Records

Anyone interested in the efficient maintenance of business records and effective administrative control over all phases of business management can secure many helpful suggestions from the new 80 page catalog "Kardex Visible Record Control" just published by the Management Controls Division of Remington Rand, Inc., 315 Fourth Ave., New York 10, N. Y. Completely revised from cover to cover, and brought up to date on the basis of a recent development in the important field of records administration, this booklet is a comprehensive presentation on all phases of the Kardex visible control principle.

28

Welding High Tensile Steels

A booklet on "The ABC's of Welding High Tensile Steels" has been issued by Arcos Corporation, 1500 South 5th St., Philadelphia, Pa., welding electrode manufacturers, to guide buyers and users of low alloy, low hydrogen electrodes. It shows the importance and effectiveness of low hydrogen electrodes in welding low alloy, high tensile steels, mild steel under highly restrained conditions, and sulphur-bearing free machining steels.

29

Plow Steel Wire Rope

A new 4-page bulletin issued by Macwhyte Co., Kenosha, Wis., condenses and combines information on plow steel wire rope. All sizes and constructive classifications are combined in one large table. The bulletin contains information on how to order wire rope and describes wire rope construction.

30

Wellpoint System

A new handbook, "The Wellpoint System in Principle and Practice," published by Griffin Wellpoint Corp., 881 East 141st St. N., New York 54, N. Y., contains information on how a wellpoint system functions. It describes the method of planning; the layout, installation, operation, and removal of the system. The manual is pocket-size, 102 pp., and illustrated with 59 photographs and diagrams. The price is $1.50 per copy. Contractors and engineers may obtain a complimentary copy upon request.

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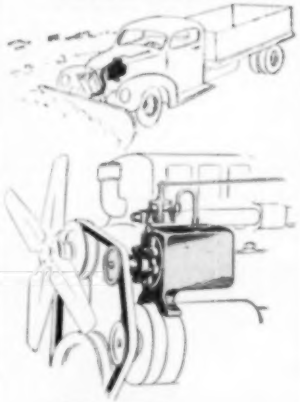

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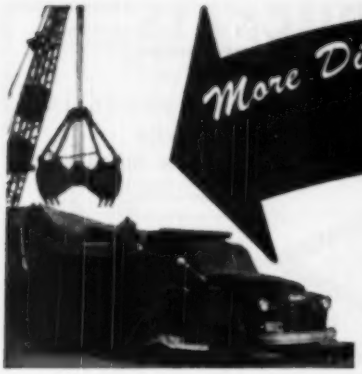

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8 ACRES OF BUYING OPPORTUNITIES

Here's a partial list of what's to be sold: D8 CATERPILLAR TRACTORS—CATERPILLAR & ADAMS MOTOR PATROLS—LeTOURNEAU SUPER C TOURNAPULLS—15 EUCLID BOTTOM DUMPS—NORTHWEST 78 SHOVEL—GALION 10-TON TANDEM ROAD ROLLER—UNIVERSAL PRIMARY CRUSHING UNIT—NORTHWEST 6 FULL COMBINATION—AIR COMPRESSORS—LeTOURNEAU LP & FU SCRAPERS—ROAD MIXERS—WELDERS, etc. *For detailed list, contact M. W. Zimmerman Co.*

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31

Stock Pile Protection

An economical method of protecting stock pile of abrasives used for ice control on highways is described in a new booklet issued by The Sisalkraft Co., 205 West Wacker Drive, Chicago 6, Ill.

32

Portable Refraction Seismograph

A completely portable refraction seismograph for use in determining the thickness of overburden and depth to bedrock is described in a catalog published by the Century Geophysical Corporation, 1353 North Utica St., Tulsa, Okla. With the proper use of the seismic refraction method and equipment, the depth to media of certain velocity differentials can be accurately determined. When these data are plotted, a graphic cross-section of the earth (up to certain limits, dependent upon the application) will be determined. This makes it possible to conduct a survey over any kind of terrain and under conditions such as river crossings, metropolitan areas, etc.

33

Steel Derricks

A complete line of steel derricks, with capacities up to 250 tons, is shown in a new 36 page catalog issued by American Hoist and Derrick Co., St. Paul 1, Minn. The six different types of derricks are treated separately in sections which include complete specifications, outline drawings and full page operating pictures. Following these sections are complete contruction details from boom point to sill connections. One page of the catalog is devoted to the correct method of determining boom length for lifting a required load to a pre-determined height at a given radius.

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WITH THE MANUFACTURERS & DISTRIBUTORS

Hyster Appointments. Two appointments in the general sales department of Hyster Co., Portland, Ore., have been announced by Philip Hill, general sales manager. Harold E. Lucas, Jr., is now an assistant to the general sales manager following 12 years' experience in merchandising for Fred Meyer, Inc. In charge of demonstrations of the Hyster grid roller, is Henry Benit, assistant to Richard Stiegele. For 14 years previously Mr. Benit was employed by the Gardner-Byrne Construction Co. of California.

H. R. Lucas, Jr.

H. Benit

Fox appointed Publicity Manager. William Fox has been appointed publicity manager of the Detroit Diesel Engine Division of General Motors Corporation, Detroit, Mich. In his new capacity, he will conduct field photographic tours and issue product news releases on Diesel engines manufactured by the Detroit Division. He joined Detroit Diesel in 1942 and has been in the Advertising Department since 1947.

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1—1945 KB11 Int'l Truck with 1941 4½ yd. Smith Hi-Discharge Mixer	6,750.00
1—1947 KB10 Int'l Truck with 1947 3 yd. Smith Hi-Discharge Mixer	6,650.00
1—1947 KB7 Int'l Truck with 1945 3 yd. Smith Hi-Discharge Mixer	3,100.00
1—1947 EHU Mack Truck with 1947 3 yd. Smith Hi-Discharge Mixer	6,650.00
1—1945 EHU Mack Truck with 1945 3 yd. Smith Hi-Discharge Mixer	4,180.00
1—1941 EQ Mack Truck with 1941 3 yd. Smith Hi-Discharge Mixer	3,150.00
1—1941 EQ Mack Truck with 1941 3 yd. Jaeger Hi-Discharge Mixer	4,000.00

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Yaeger 6" Pump with 20 ft. suction hose like new.
Austin 10 ton 3 wheel Roller.

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Primary crushing plant consisting of 1-15-36 Pioneer roller bearing jaw crusher, Pioneer rock feeder, 30" undercrushed conveyor, Caterpillar D9800 Diesel Power Plant.

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D13000 Caterpillar Diesel Motor

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Model "D" Allis-Chalmers tractor and Baker Dozer complete

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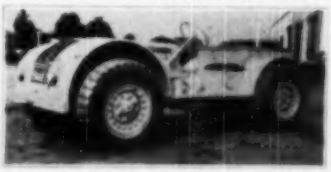

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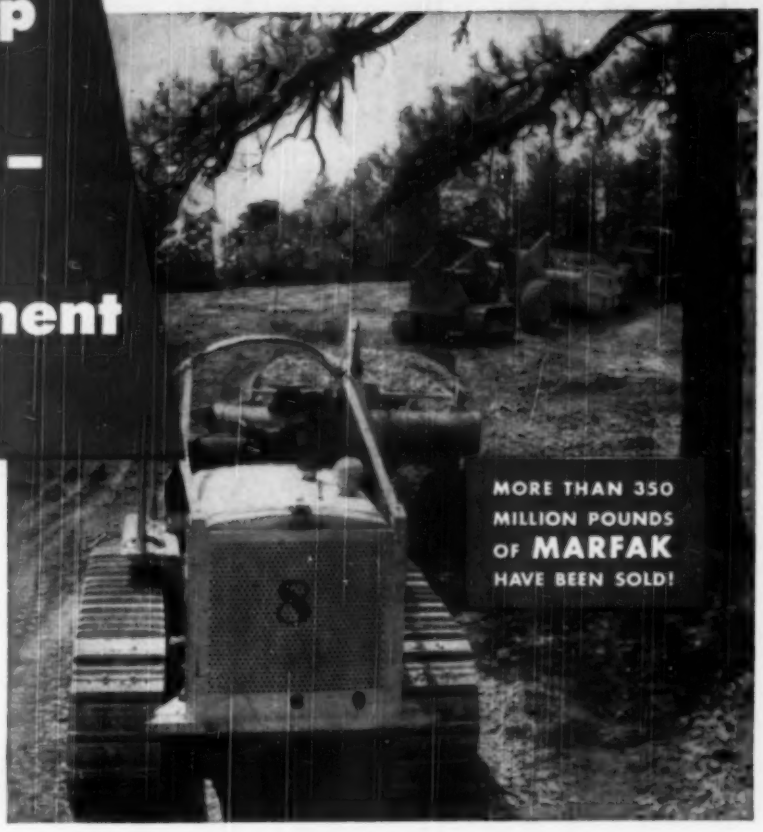

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